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ABSTRACT

Part 2 of a two-part report describes nine supplemental studies used to test K-MUST, the Kansas Manpower Utilization System for Training. For each study, an introduction, background information, procedures, analysis, and conclusions and recommendations are provided. The studies are: (1) a comparison of Federal matrix manpower needs projections and employer survey manpower needs projections for small labor markets, (2) an analysis of the accuracy of modified matrix projected occupational profiles for urban labor markets, (3) the use of manpower needs and student interest to plan vocational and technical education in Kansas, (4) an analysis of the net manpower needs in the Kansas City Standard Metropolitan Statistical Area from 1972 through 1976, (5) a physical facility utilization survey of the 14 area vocational-technical schools in Kansas, (6) participation rates of disadvantaged and handicapped groups in Kansas area vocational and technical school programs, (7) a cost/benefit analysis of training programs in Kansas' 14 vocational area schools, (8) the development of a decision model for vocational-technical education planning, and (9) handbook for vocational and technical education planners: cycle 2, January, 1973. A 15-page bibliography and 122 pages of appended material conclude the document. (AG)

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FINAL REPORT

VOLUME II:

SUPPLEMENTAL STUDIES

U.S. DEPARTMENT OF HEALTH,
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KANSAS MANPOWER UTILIZATION SYSTEM FOR TRAINING

Division of Vocational Education
Kansas Department of Education
and
Department of Adult and Occupational Education
Kansas State University

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KANSAS MANPOWER UTILIZATION SYSTEM FOR TRAINING (K-MUST)

FINAL REPORT

VOLUME II: SUPPLEMENTAL STUDIES

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August 1973

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FOREWORD

This second volume of the K-MUST Final Report documents nine major studies conducted to test system modules presented in Volume I. The first eight of the nine studies represent doctoral dissertations prepared by K-MUST staff members or other graduate students in the College of Education at Kansas State University. The ninth study is the second annual cycle of the K-MUST Handbook for Vocational and Technical Education Planners.

The first two studies examine the accuracy of the manpower demand projecting system module. Dr. Jimmie L. Downing, presently Academic Dean at Barton County Community College, investigated the accuracy of projections in small labor markets while Dr. R. B. Daniels, presently State Supervisor of Industrial Education, investigated the accuracy of projections in larger urban labor markets.

In the third study, Dr. Robert Price, presently a research project director at Southern Illinois University, examined the relationships between manpower demand and student interest to determine if these two factors are compatible planning criteria. He also studied the relationships between these two planning criteria and the present vocational enrollment in Kansas in an effort to determine the basis of past program planning in the state. During his investigations, he tested the student interest systems module.

Dr. Brynjulv Norheim, presently a lecturer at the University of Oslo in Norway, projected net manpower needs in the Kansas City Standard Metropolitan Statistical Area in the fourth study. Of special interest was an examination of overlapping efforts occurring because of coordination problems across the Kansas-Missouri state line. In the course of his study, he tested the interfacing system module and the interstate planning module.

In the fifth study, Dr. Jim Downs, presently an associate professor at Metropolitan State College in Denver, examined facility usage in Kansas' fourteen area schools. During the course of his work, he tested the facility usage system module.

The disadvantaged and handicapped system module was tested in the sixth study. Dr. David Jones, presently principal at Olathe High School in

Olathe, Kansas, examined the participation rates of five disadvantaged or handicapped groups in Kansas' fourteen area schools. Participation rates are presented by school, by program and by program type across schools.

In the seventh study, Dr. Jack De Vore, presently an assistant professor at the University of Arkansas, examined societal cost/benefit relationships of various training programs in Kansas' fourteen area schools. Of special interest was his approach to estimating payback periods and long run accrued benefits. During his study, he tested the cost-benefit system module.

In the eighth study, Dr. Dale Brooks, presently director of the Central Kansas Area Vocational Technical School, developed optimum program mixes for the CKAVTS service area and the state as a whole relative to placement of graduates in employment related to their training. A comparison of the optimum mixes and the present mixes proved very interesting. During the course of his work, he tested the optimum program mix system module.

Finally, in the ninth study, the K-MUST staff presents an interfacing of manpower demand and manpower supply for the state and eleven regions within the state, estimates of upgrading training needs, a summary of student interest data, and data tables summarizing potential student populations. This study is the second cycle of a continuing system report entitled the K-MUST Handbook for Vocational and Technical Education Planners.

Part 1

A COMPARISON OF FEDERAL MATRIX MANPOWER NEEDS PROJECTIONS
AND EMPLOYER SURVEY MANPOWER NEEDS PROJECTIONS
FOR SMALL LABOR MARKETS

Jimmie Lee Downing

Chapter 1

INTRODUCTION

BACKGROUND

The manpower and educational legislation of the last decade has continuously underlined the need for more and better information about the manpower needs of current and future local labor markets. Section 106 of the Manpower Development and Training Act¹ as amended and Section 123 of the 1968 Amendments to the 1963 Vocational Education Act² indicate that projections of present and future manpower needs are an essential part of the vocational planning effort.

The Department of Labor presently recognizes at least five major techniques which can be used to project manpower demand.³ These are:

1. The Area Skills Survey,
2. The Leading Indicators Experiment Approach,
3. The Industry Expert Approach,
4. The Unfilled Job Openings - Occupational Outlook Handbook Approach, and
5. The BLS Occupation By Industry Approach.

Of these five, the two which have proven most popular are the Area Skills Survey and the BLS Occupation By Industry Approach. (Note: The latter is more commonly call the BLS Matrix Approach while the former is often called the Employer Survey.) In comparing these two approaches, several factors come to light including the following.⁴

1. Employer surveys are relatively expensive since the average interview costs more than six dollars when time, travel and processing are considered.
2. Employer surveys rely on a stratified random selection of firms to be surveyed for generalizability of the data. Since many firms do not respond, the generalizability of the data is in some question.
3. There is some question as to whether the average employer is able to make accurate projections of long-range manpower needs for his firm.
4. The matrix approach is usually restricted to statewide or large

urban area projections since input for the matrix includes labor market profile data which are normally not available for small labor markets.

5. When using the national matrix there is a question as whether the factors and ratios are applicable to small labor markets.

Analyzing the above factors, it might seem that the ideal way to gather labor market needs data would be to use the matrix approach to project the needs of larger labor markets such as a state or the nation and use the employer survey approach to project the needs of the local labor market.

Examination of other factors, however, indicates that most local vocational education administrators do not have the resources, time or expertise to conduct local surveys. Possibly the best solution to the problem of making manpower needs projections would be to modify present matrix approaches so that reasonably accurate data could be generated for the local administrator.⁵

In September of 1971, the Division of Vocational Education of the Kansas Department of Education contracted with Kansas State University for the development of a management information system to aid in the planning of vocational and technical education. An integral part of this system is a technique designed to forecast manpower needs in local labor markets. Because of limited funds, the employer survey technique was not deemed feasible which left only the matrix approach. However, as indicated above, the matrix approach was tied to labor market profiles which were not available for the small labor markets. A new matrix approach was derived which broke away from the profile concept by utilizing the BLS factors and ratios in conjunction with present local employment totals by Standard Industrial Classification (SIC).⁶

Although the modified matrix approach seems to be logically sound, there is no empirical evidence which can be used to evaluate the technique.

STATEMENT OF THE PROBLEM

This study will attempt to answer the question, "What is the size and source of error in manpower projections generated by the modified matrix technique?"

PURPOSE OF THE STUDY

Because of the immediate need for evaluation of the modified matrix

technique, a longitudinal examination is not feasible.⁷ Estimates of present employment by occupation generated by the technique, however, can be empirically examined using cross-sectional techniques.⁸ The purpose of this study is to partially evaluate the modified matrix technique by comparing the estimated present employment by occupation with the actual occupational profile (100 per-cent employer survey) in two local areas in Kansas.

NEED FOR THE STUDY

Planning, evaluation and funding of vocational and technical education in Kansas will be based, in part, on the manpower needs projections generated by the modified matrix technique. It is essential, therefore, that these projections be as accurate as possible. If there are areas where significant inaccuracies result from the use of the technique, the system managers must be aware of both the type and degree of error as soon as possible.

This study will provide a partial evaluation of the accuracy of the technique at a level where error can best be identified and will indicate possible approaches for improving projections. In addition, the cross-sectional format of the study will provide evaluation results before other evaluations are possible and hence decrease reaction time for improvements of the technique.

ASSUMPTIONS

The analysis and interpretation of data done in this study are based on the following assumptions:

1. Employers will be able to define the occupations of their employees in terms used by the matrix approach.
2. Employers will be willing to cooperate in providing data on the number and type of employees in their organization.
3. Maximum error will be found in small labor markets where national and state ratios will be applied to local employment totals. (Note: Conversely, the larger the labor market, the better projections will be.) Hence, this study is testing situations where inaccuracies will be greatest.
4. Economic conditions will not significantly affect the degree of error found in small labor market projections generated by the modified matrix.

DELIMITATIONS

The following are delimitations of this study:

1. Only two small labor markets will be surveyed and compared with matrix projections.
2. Estimated employment will be compared with present employment, however, projected job openings cannot be compared with actual job openings for the projected period. This means that this study will provide only a partial evaluation of the technique.

HYPOTHESES

This study will evaluate the matrix technique by testing the following hypotheses.

Hypothesis 1

There will be a significant difference between the present occupational profile derived using the modified matrix approach and the occupational profile as determined by the employer survey.

Hypothesis 2

A rationale can be developed to define a scale table which will indicate accuracy of projections for various sized labor markets.

FOOTNOTES

¹U.S. Congress, Senate, Committee on Education, Manpower Development and Training Act of 1962, Hearing, 87th Cong., 1st Sess., March 15, 1962 (Washington: Government Printing Office, 1963).

²U.S. Congress, House, Committee of Education, Vocational Education Act of 1963, Hearing, 88th Cong., 1st Sess., March 25, 1963 (Washington: Government Printing Office, 1964).

³William R. Fischer, "Project Vision: An Experiment with Occupational Needs Projection Techniques for Vocational Education Curriculum Planning Purposes," (Wisconsin State Employment Service, June, 1970). (Mimeographed).

⁴Statement by James L. Harris, K-MUST Project Director, personal interview, January 15, 1972.

⁵James L. Harris and Robert E. Scott, "Using a Matrix Approach to Project Manpower Needs in a Small Labor Market," (unpublished paper, Kansas State University, 1972), p. 2.

⁶Ibid., p. 5.

⁷Statement by John Snyder, Asst. Commissioner, Vocational Education, Kansas State Department of Education, personal interview, February 13, 1972.

⁸Statement by James L. Harris, K-MUST Project Director, personal interview, January 15, 1972.

Chapter 2

BACKGROUND INFORMATION

INTRODUCTION

This chapter is concerned with background information that identifies, defines and explains key concepts used in this study.

DEFINITIONS

Bureau of Labor Statistics (BLS)

The Bureau of Labor Statistics is a component of the Department of Labor which has the primary responsibility for the technical development and statistical adequacy of the matrix system used to project national manpower needs.¹

Bureau of Labor Statistics Occupation by Industry Matrix (BLS Matrix)

The BLS Matrix is a set of employment and expansion ratios pertaining to various industries and occupations within industries. The matrix covers 116 industrial clusters and 162 occupational clusters which represent the entire economy.²

Experimental Employer Needs Survey

The Experimental Employer Needs Survey is a refined modification of the Area Skill Survey Technique used to project manpower needs. The Area Skill Survey is conducted by means of a mail or interview questionnaire which asks individual employers to forecast their employee requirements for a projection period, taking into account both replacement and expansion needs.³

Industry Expert Approach

The Industry Expert Approach is a method of projecting manpower needs

using interviews with industry experts from a single industry group. This method is used to arrive at projections for a particular type of industry.⁴

Labor Force

The Labor Force is the total number of workers available minus the size of the armed forces and assuming a national unemployment rate of three percent.⁵

Labor Market

The Labor Market is the total number of jobs available in the economy.

Leading Industries Experiment Approach

The Leading Industries Experiment Approach projects manpower demand by identifying the leading firms which might be among the more progressive and whose occupational mix and projected employment trend might provide information useful for vocational education planning.⁶

Manpower Demand

Is the total number of measured or projected skilled persons needed during the time period under consideration, categorized according to specific skill, or "skill cluster."⁷

Manpower Supply

Is the total number of measured or projected skilled persons available during the time period under consideration, categorized according to specific skill or "skill cluster" and the supply source where this skilled person is located.⁸

Standard Industrial Classification (SIC)

Is a system whereby each industry is assigned a code on the basis of its major activity, which is determined by the product or group of products produced or handled, or services rendered. The structure of the system makes it possible to classify establishments by industry on a two digit, a three digit, or a four digit basis, according to the degree of detail in information which may be needed.⁹

Unfilled Job Openings - Occupational
Outlook Handbook Approach

This is a technique for projecting manpower demand by using data available from selected records of the Employment Service agencies, in combination with routinely collected information from other Federal and State agencies to form its data base. This data may then be used for the planning of vocational programs.¹⁰

THE HISTORICAL SETTING

Over the past decade, manpower legislation has continuously emphasized the need for vocational education to be based on the manpower demands of the local community, the state and the nation. Examples of legislative acts which specifically address this need are:

1. The Area Redevelopment Act of 1961,¹¹
2. The Manpower Development and Training Act of 1962,¹²
3. The Vocational Education Act of 1963,¹³
4. The Higher Education Facilities Act of 1963,¹⁴
5. The Economic Opportunity Act of 1964,¹⁵
6. The Civil Rights Act of 1964,¹⁶
7. The Higher Education Act of 1965,¹⁷
8. The Appalachian Act of 1965,¹⁸
9. The 1968 Amendments to the 1963 Vocational Education Act.¹⁹

The 1968 Amendments to the 1963 Vocational Education Act, possibly the most influential legislation on vocational education today, states that it is the responsibility of vocational educators to provide vocational training which is "realistic in the light of actual or anticipated opportunities for gainful employment."²⁰ To facilitate this mandate, the State Employment Security Commission offices are given the responsibility of "making available to the State board and local educational agencies occupational information regarding reasonable prospects of employment in the community and elsewhere..."²¹

In many cases, the State Employment Security Commissions have not been able to meet this responsibility. Medvin²² comments on this problem as follows:

The State Employment Services with no additional funding and with the traditional and costly skill survey technique available to them, have in many instances been unable to furnish the information which by law they are obligated to provide.

Given the responsibility to provide manpower needs data and without the funds to conduct manpower skill surveys, the Department of Labor has funded research to investigate alternative methods for projecting manpower needs. These include:

1. The Leading Indicators Experiment Approach,
2. The Industry Expert Approach,
3. The Unfilled Job Openings - Occupational Outlook Handbook Approach, and
4. The BLS Occupation by Industry Approach.²³

Of these alternative methods, the most satisfactory is the BLS Occupation by Industry Approach more commonly referred to as the BLS Matrix Approach.²⁴ This approach provides a reasonably detailed (by occupation) picture of a given work force and is relatively inexpensive.²⁵

The BLS Matrix Approach has two alternative techniques to the development of manpower needs projections; i.e., Area Projection Method A and Area Projection Method B. The first is a relatively simple system that is dependent upon both the base period national matrix (1960) and the projected national matrix (1975). The second is more complex; it requires the development of an area base period matrix (1960).²⁶

The matrix itself consists of a set of tables reflecting trends in employment for occupations within Standard Industrial Classifications. In simplest terms, the methods are techniques for utilizing the matrix to first determine the occupational profile of the area and second determine the projected manpower needs in those occupations.²⁷

There are two major criticisms of the BLS Matrix Approach; i.e., it applies national trends to local (state) situations²⁸ and it cannot provide projections for small labor markets.²⁹ In addition, State Employment Security Commissions are having difficulty finding the financial resources necessary to develop projections utilizing this technique even though it is relatively inexpensive.³⁰

In the late summer of 1971, the Division of Vocational Education of the Department of Education in Kansas contracted with Kansas State University for the development of a system to project manpower needs which could be used as a basis for planning vocational education.³¹ One of the criteria on which the system was to be based was that it be inexpensive enough to be cycled at least

once a year. Additionally, it was to have the capability of projecting manpower needs in small labor markets utilizing localized trend data to the greatest extent possible.³²

The system development staff selected the matrix approach as that technique that most closely met the needs of the Department of Education. With the help of the State Employment Security Commission, the Regional Office of the Bureau of Labor Statistics and the Regional Manpower Administration Office, a new method of utilizing the matrix was developed which provided for the input of localized trends and allowed for projections of small labor markets.³³

Preliminary examination of the output of this modified matrix approach indicates that the error in the development of occupational profiles for small labor markets is not a restricting factor, however, further investigation must be conducted with the intent of identifying areas where projections are weak and additional modifications might improve the final output.³⁴

AREA PROJECTION METHOD A

Using this technique, estimates of area occupational requirements are made by applying 1960 and 1975 national industry-occupational patterns to appropriate area industry employment estimates; summing the occupational totals; computing a change factor (1960-1975) for each occupation; and applying the change factors.

The equation used is:

$$L_j (75) = \frac{\sum_{i=1}^n f_{ij} (75) L_i (75)}{\sum_{i=1}^n f_{ij} (60) L_i (60)} L_j (60)$$

where:

L_j (year) = total local employment in occupation j;

L_i (year) = total local employment in industry i;

f_{ij} (year) = National fraction of occupation j in industry i.

As an example, (1) if automobile mechanics were employed in automobile sales and automobile repair industries exclusively, (2) if there were 10,000 workers in automobile sales and 50,000 workers in automobile repair in a given

labor market in 1960, and (3) if there are projected to be 12,000 workers in automobile sales and 55,000 workers in automobile repair in the same labor market in 1975, the calculations using Method A would be:

$$\frac{(.4965^a * 12,000^b) + (.2953^a * 55,000^b)}{(.4417^a * 10,000^c) + (.3321^a * 50,000^c)} * (20,000^c)$$

(Note: ^a indicates the data is from matrix tables, ^b indicates that data is estimated employment usually done by extrapolation of Unemployment Insurance Account records and ^c indicates that the data is from 1960 census occupational profiles and related data.)

or, there will be about 21,120 automobile mechanics employed in 1975 which is an increase of 1,120 (21,120 - 20,000) automobile mechanics jobs from 1960 to 1975.

This technique is limited in that 1960 census occupational profiles are not available for many local areas in the nation.

THE MODIFIED MATRIX TECHNIQUE³⁵

The modified matrix technique developed by Kansas State University is based on the following assumptions.

1. The occupational structure of the local industries is similar to the national pattern for that type of industry.
2. Adjusting the derived local occupational profile in terms of the state occupational profile as presented by the Kansas Employment Security Commission will improve the local occupational profile estimate.
3. National expansion figures for a particular type of occupation in a particular type of industry are a reasonable estimate of how that type of industry will expand in the local labor market.
4. Adjustments of the local expansion estimates in terms of past local labor market trends will improve the local expansion rate estimates.
5. National replacement factors are reasonable estimates of the replacement rates in local industry.
6. The use of the present year industrial structure will offset some of the error derived from using national base factors and ratios.

Based on the above assumptions, the modified matrix technique uses the following steps to project manpower needs.

1. Determine the Standard Industrial Classification (SIC) structure of the local community.
2. Determine the occupational profile estimate of the local community.
3. Adjust the local occupational profile estimate in terms of the state occupational profile provided by the Kansas Employment Security Commission.
4. Determine the projected expansion of employment for the projection period based on occupation by industry rates.
5. Adjust the projected expansion in terms of the past labor market trends of the local area.
6. Determine the need for replacement of workers in various occupations.
7. Sum replacement needs and expansion needs to determine total manpower needs over the projection period.

These seven steps are explained in detail below.

The Standard Industrial Classification (SIC) Structure of the Local Community

The modified matrix approach requires that all employing firms in the labor market be identified by (1) the nature of the work done by the firm as defined by SIC codes and (2) the number of employees in the firm. This data is accumulated into number of employees in a particular type of industry (SIC) in the local labor market.

The data on individual firms is based on a data set called Dun's Market Identifiers (R) which is purchased from Dun and Bradstreet, Inc. This data set is supplemented by the Employment Services Unemployment Insurance Account data, telephone directories, government directories, Department of Agriculture studies, and Wichita State University's Health Manpower Study.

Deriving the Occupational Profile

To break the employment by SIC into employment by occupation, percentages found in the BLS Matrix are used. For example, the percent of workers in the furniture and fixture manufacturing industry who are cabinetmakers (as indicated in the BLS Matrix) is presented in Table I below.

Table 1

Percentage Of Furniture And Fixture
Workers Who Are Cabinetmakers

	Percentage of Workers	
	1970	1980
Cabinetmakers	6.40	4.42

If in a local community in 1971 there were 1,000 workers in the furniture and fixtures manufacturing industry, then using a straight line technique, an estimated 62.02 cabinetmakers would be found in the industry locally. The formula used to derive this figure is:

$$\frac{(1970 \text{ Percent} - 1970 \text{ Percent} - 1980 \text{ Percent})}{1980 - 1970} \cdot \text{Number of Workers}$$

or:

$$(.64 - \frac{.064 - .0442}{10}) \cdot (1000) = 62.02$$

Estimate the Expansion Needs

To estimate the expansion needs for workers of a particular type in a given industry, figures in the BLS Matrix are used. Examples of these figures for cabinetmakers in the furniture and fixture manufacturing industry are found in Table II.

Table 2

Employment Of Cabinetmakers In Furniture
And Fixture Manufacturing

	1970 Employment	1980 Employment
Furniture and Fixture Manufacturing	135,950	182,500

Given the above figures, it is estimated that the number of cabinetmakers in furniture and fixture manufacturing will expand at a rate of approximately

thirty-four percent over a ten-year period or about 3.4 percent per year. In the example, if a three-year expansion need projection is required, then there would be a need for 6.32 cabinetmakers. The formula used to determine the number of cabinetmakers needed to meet expansion needs in the furniture and fixture manufacturing industry is:

(Annual Expansion Rate) . (Number of Years) . (Number of Workers)
or in the example:

$$.034 \times 3 \times 62.02$$

Once the expansion needs have been estimated, the total number of cabinetmakers and related expansion needs are summed for all SIC's. An example of how this might look is presented in Table III.

Table 3

Summation Of Cabinetmaker Data For All SIC's
In A Local Labor Market Situation

Standard Industrial Classification	Number of Cabinet- makers	Expansion Needs
Furniture and Fixture Manufacturing	62.02	6.32
Furniture Repair	9.43	1.20
Furniture Sales	11.96	2.33
Construction	6.01	.44
Other	4.34	.16
TOTAL	93.76 94	10.45 10

Adjustment of the Estimated Occupational
Profile

The total number of cabinetmakers and related expansion needs computed for the local labor market are then adjusted in light of the difference between the BLS Matrix Model A estimates of the Kansas occupational profile as modified by the Kansas Employment Security Commission and the statewide unadjusted occupational profile generated by the modified matrix technique. For example, if the number of cabinetmakers generated by the modified matrix technique differ

by a -8.2 percent, the number of cabinetmakers estimated in the local labor market would be reduced by that percent. The expansion needs are treated in the same way.

Adjustment of the Expansion Needs Based on Local Labor Market Histories

The history of the local labor market in terms of total employment is examined for the past ten years. If the average increase or decrease in employment is different than the change projected by the modified matrix for the total local labor market, then individual occupational changes are adjusted accordingly.

Computation of Replacement Needs

Workers to fill new job openings is not the only factor in the manpower demand picture and often it is not even the major element. The need to replace workers who die, retire or leave the occupation is also an important factor.

Annual replacement factors provided by the Employment Security Commission are used to compute the number of workers needed to replace those who die, retire, or leave the occupation. If the annual replacement factor for cabinetmakers is 2.7 percent then in the example, 7.60 workers would be needed to replace cabinetmakers in the next three years.

Total Needs

The total manpower needs is equal to the sum of the expansion needs and the replacement needs. In the example, there would be a need for approximately eighteen ($7.60 + 10.45$) cabinetmakers over the three-year period.

FOOTNOTES

¹Department of Labor, Bureau of Labor Statistics, "Statement on the Industry; Occupational Matrix Program" (unpublished paper, Department of Labor, 1971), p. 7.

²Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Vol. IV, The National Industry-Occupational Matrix and Other Manpower Data (Washington: Government Printing Office, 1969), p. 5.

³William R. Fischer, "Project VISION: An Experiment with Occupational Needs Projection Techniques for Vocational Education Curriculum Planning Purposes" (Wisconsin State Employment Service, June, 1970), p. 8. (Mimeographed.)

⁴*Ibid.*, p. 11.

⁵Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Vol. II, National Trends and Outlook: Industry Employment and Occupational Structure (Washington: Government Printing Office, 1969), p. 6.

⁶Fischer, *op. cit.*, p. 10.

⁷Braden, Paul V., James L. Harris, and Krishan K. Pauls., et al., Occupational Training Information System: A Final Report Complete with System Documentation (Stillwater: Oklahoma State University Research Foundation, 1970), p. 21.

⁸*Ibid.*, p. 22.

⁹Bureau of the Budget, Office of Statistical Standards, Standard Industrial Classification Manual (Washington: Government Printing Office, 1967), p. xi.

¹⁰Fischer, *op. cit.*, p. 13.

¹¹U.S. Congress, Area Redevelopment Act, Public Law 87-27, 87th Cong., 1961 (Washington: Government Printing Office, 1961).

¹²U.S. Congress, Manpower Development and Training Act of 1962, 87th Cong., 1962 (Washington: Government Printing Office, 1962).

¹³U.S. Congress, Vocational Education Act of 1963, Public Law 88-210, 88th Cong., 1963 (Washington: Government Printing Office, 1964).

¹⁴U.S. Congress, Higher Education Facilities Act of 1963, Public Law 88-210, 88th Cong., 1963 (Washington: Government Printing Office, 1963).

¹⁵U.S. Congress, Economic Opportunity Act of 1964, Public Law 89-4, 89th Cong., 1964 (Washington: Government Printing Office, 1964).

¹⁶U.S. Congress, Civil Rights Act of 1964, Public Law 88-371, 88th Cong., 1964 (Washington: Government Printing Office, 1965).

¹⁷U.S. Congress, Higher Education Act of 1965, Public Law 89-329, 89th Cong., 1965 (Washington: Government Printing Office, 1965).

¹⁸U.S. Congress, Appalachian Act of 1965, Public Law 89-502, 89th Cong., 1965 (Washington: Government Printing Office, 1965).

¹⁹U.S. Congress, Vocational Education Amendments of 1968, Public Law 90-576, 90th Cong., 1968 (Washington: Government Printing Office, 1968).

²⁰Fischer, op. cit., p. 3.

²¹Norman Medvin, "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting," Employment Service Review, (January-February, 1967), p. 63.

²²Ibid.

²³Fischer, op. cit., p. 8-15.

²⁴Ibid., p. 4.

²⁵Ibid.

²⁶Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Vol. II, Using National Manpower Data to Develop Area Manpower Projections (Washington: Government Printing Office, 1969), p. 11.

²⁷Ibid., p. 7-10.

²⁸Ibid., p. 5.

²⁹Ibid.

³⁰Medvin, op. cit., p. 64.

³¹Statement by James L. Harris, K-MUST Project Director, personal interview, March 13, 1972.

³²Ibid.

³³James L. Harris and Robert E. Scott, "Using a Matrix Approach to Project Manpower Needs in a Small Labor Market" (unpublished paper, Kansas State University, 1972), p. 2.

³⁴Harris, op. cit.

³⁵Harris and Scott, op. cit., p. 5.

Chapter 3

PROCEDURES

INTRODUCTION

The purpose of this chapter is to describe the procedures, data and tools that were used to evaluate the hypotheses presented in Chapter 1.

THE POPULATIONS

There are two types of populations directly involved in this study. The first is the population of counties with small labor markets in Kansas. The second is the population of jobs by occupational type in each county.

Since the economy of Kansas varies greatly from east to west with the eastern counties being involved with manufacturing, mining, and small farm operations, and the western counties being involved principally in large farming operations, the counties with small labor markets were roughly divided into two sub-populations, i.e., eastern counties and western counties for sample stratification purposes. A further refining of the two sub-populations was achieved by eliminating the central Kansas counties which are difficult to classify as either eastern or western counties. Once the central Kansas counties were eliminated, there were twelve eastern and thirty-three western counties with labor forces of less than 3,000 workers. A listing of these counties can be found in Appendix A.

The population of jobs (occupational profile) in the counties with small labor markets constitute the second major population type involved in this study. The modified matrix projects an occupational profile of 162 jobs or job clusters for each county. This profile represents all employment in the labor market.

THE SAMPLES

There are three samples involved in this study. The first is a

stratified random sample of counties on the basis of the eastern and western classification. One eastern county (Wabaunsee) and one western county (Edwards) were randomly selected to be surveyed. The second two samples consisted of all employment in each of the two counties.

THE INSTRUMENT

The interview instrument (see Appendix B) was designed in the spring of 1972 in cooperation with the K-MUST staff. A copy of the instrument was used for each employer to be surveyed. The instrument consists of a listing of jobs and job clusters identical to those generated by the modified matrix with space provided to enter the number of employees in each job or job cluster during an interview. The instrument is not open-ended since every occupation is classifiable under the structure provided.

DATA COLLECTION

The data collected for this study consists of the number of workers by occupation of all non-farm employers in Wabaunsee and Edwards counties in Kansas. Each employer was visited to determine how many workers were employed and what occupations were involved. On-farm data used in this study was found in 1972 unpublished employment security data.

From June 7, 1972 through June 16, 1972, 146 employers in Wabaunsee County were surveyed. These employers reported 781 workers in 60 occupations. Every effort was made to contact all off-farm employers in the county and as far as can be determined, all were successfully surveyed.

From June 19, 1972, through June 26, 1972, 160 employers in Edwards County were surveyed. These employers reported 939 workers in 81 occupations. Again, every effort was made to contact all off-farm employers in the county and, again, as far as can be determined, all were successfully surveyed.

INTERVIEWING TECHNIQUES

It should be noted that 306 interviews were conducted during the course of this study. In no instance, was cooperation refused and in only

two instances was the interview postponed. Interviewing was conducted strictly by the outline found in Scott's Occupational Surveys.¹ A description of the interview procedure is as follows.

1. The interviewer introduced himself, explained the subject and purpose of the study, explained ~~that~~ all employers in the county were being surveyed, and that the interview was confidential relative to specific employers.

2. The interviewer emphasized that cooperation was voluntary, that the survey was important to the interviewee and that the interviewee's answers were important to the survey results.

3. The interviewer dressed in accord with community standards which, in this case, included slacks and a dress shirt with no tie.

4. The interview was conducted in the place of business with no one present except the interviewer and the interviewee.

5. The questionnaire was explained and the interviewee responded with the number and occupation of employees.

6. Probes were used when responses were irrelevant, unclear, or incomplete.

7. Responses were recorded at the time they were made.

8. The interviewee checked the questionnaire to ascertain completeness and accuracy of the reporting before the interviewer left the place of business.

9. The interviewer thanked each interviewee before leaving.

STATISTICAL TOOLS

Two statistical tools were used to analyze the data for this study. The two tools used are techniques normally described in standard statistics text books. Hypothesis 1 requires the use of the Chi Square Test of Independence while Hypothesis 2 requires the use of Curvilinear Regression Analysis.

The Chi Square Test of Independence is an extremely useful statistical procedure for determining whether two nominal (or higher level) measures are related. If one of the variables is group membership, and the other a criterion of some sort, the test may be used to determine whether two or more populations are distributed in the same fashion with respect to the criterion.²

In this case, data generated by the modified matrix technique and

data determined through the survey constitute membership in two different groups while occupations constitute the criterion on which the groups are distributed.

A Chi Square value is calculated where the size of the value is determined by the discrepancies in the match of the two data groups with respect to the criterion; the value being higher where the discrepancy is greater. If the Chi Square value is greater than some pre-determined figure, then a significant difference is said to exist. The confidence in which this statement can be made rests on the pre-determined figure selected. In this study, ninety-five percent confidence will be acceptable and hence, the figure will be selected on this basis.

The first step in determining the Chi Square value is to arrange the data into rows and columns with the rows being occupations and the columns being group membership. If, for example, ten workers were projected to be welders by the modified matrix column and the welder row would be ten.

Once the data has been arranged in this fashion, the values in the columns and rows are summed. When the columns and rows have been summed, the expected frequency for each cell is computed. Expected frequencies are the values which would exist in the cells if the row and column sums did not change and if the distributions were identical. The expected frequency for each cell is derived by multiplying the row total times the column total and dividing by the total of all entries.

The Chi Square contribution of each cell is computed by squaring the difference of the cell's expected frequency and actual value and dividing by the expected frequency. The Chi Square value is the sum of all Chi Square contributions.

The pre-determined value for the ninety-five percent confidence level is computed with the following formula:

$$\chi^2 = \frac{1}{2} (1.6449 + 2df - 1)^2$$

In this formula, df stands for degrees of freedom while χ^2 stands for the pre-determined or tabular Chi Square value.

The degrees of freedom are determined by multiplying the number of rows minus one, times the number of columns, minus one. The reason one is subtracted is that if a set number of items is assigned to a set number of cells where row and column totals are fixed, one row and one column of cells are not free to vary.

Again, if the Chi Square value computed using the two distributions is greater than the tabular Chi Square value, then a significant difference is said to exist between the two distributions.

Curvilinear Regression is a special case of Bivariate linear regression where the second independent variable is a function of the first independent variable. In the case presented in this study, scattergram evidence indicates that the greater the size of the labor market, the less the percent of error which suggests that the relationship between size of projection and the degree of error may be forecasted by some second degree polynomial. If this is the case, then the first independent variable (number projected by matrix) is related to the second independent variable (number projected by matrix squared) in the manner expressed in the following function:

$$x_1^2 = x_2$$

It should be noted that Snedecor and Cochran³ describe Curvilinear Regression as a technique for fitting a curve to data or curve fitting. This is in effect what is being done in this analysis. They also indicate that extrapolation of the curve is a dangerous procedure and should not be used unless such extrapolation is absolutely necessary. Since the counties examined in this study do not have any large occupational clusters and since it is desirable to estimate the average error for large occupational clusters, extrapolation has been accepted while the limitations of such a procedure will be noted. One restriction is placed on this extrapolation, however, estimating error will be limited to a curve segment which stops considerably short of the inflection point.

The problem is to determine the constants b_1 , b_2 and c in the polynomial. The Curvilinear Regression Equations to make these determinations are:

$$b_1 = \frac{(\sum x_1 y) (\sum x_2^2) - (\sum x_1 x_2) (\sum x_2 y)}{(\sum x_1^2) (\sum x_2^2) - (\sum x_1 x_2)^2}$$

$$b_2 = \frac{(\sum x_1^2) (\sum x_2 y) (\sum x_1 x_2) (\sum x_1 y)}{(\sum x_1^2) (\sum x_2^2) - (\sum x_1 x_2)^2}$$

$$c = \frac{\Sigma Y - b_1 \Sigma X_1 - b_2 \Sigma X_2}{N}$$

The variables in the equations above are derived as follows:

$$1. \quad \Sigma x_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N}$$

$$2. \quad \Sigma x_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N}$$

$$3. \quad \Sigma x_1 x_2 = \Sigma X_1 X_2 - \frac{(\Sigma X_1)(\Sigma X_2)}{N}$$

$$4. \quad \Sigma x_1 y = \Sigma X_1 Y - \frac{(\Sigma X_1)(\Sigma Y)}{N}$$

$$5. \quad \Sigma x_2 y = \Sigma X_2 Y - \frac{(\Sigma X_2)(\Sigma Y)}{N}$$

Where:

1. ΣX_1^2 is the number projected for each occupation squared then summed for all occupations.
2. $(\Sigma X_1)^2$ is the sum of all numbers projected by the matrix which is then squared.
3. ΣX_2^2 is the number projected for each occupation squared then summed for all occupations.
4. $(\Sigma X_2)^2$ is the sum of all numbers projected by the matrix squared, then summed for all occupations.
5. $\Sigma X_1 X_2$ is the number projected by the matrix times the number projected squared.
6. ΣX_1 is the sum of all numbers projected by the matrix.
7. ΣX_2 is the sum of all numbers projected squared.
8. $\Sigma X_1 Y$ is the number projected for each occupation times the number of error for each occupation then summed for all occupations.
9. ΣY is the sum of all error in the matrix projections.
10. $\Sigma X_2 Y$ is the number projected for each occupation squared times the number of error for each occupation then summed for all occupations.

ANALYSIS PROCEDURES

The analysis procedures used to affirm or reject the hypotheses examined in this study are explained below.

Hypothesis 1

Hypothesis 1 which states "There will be a significant difference between the present occupational profile derived using the modified matrix and the occupational profile as determined by the employer survey." will be tested by comparing the two distributions for two Kansas counties.

The hypothesis will be affirmed if both Chi Square Tests indicate a significant difference. The hypothesis will be rejected if both Chi Square tests indicate no significant difference. The hypothesis will be considered unaffirmed but not rejected if a significant difference is found in one test but not in the other.

The .05 level of significance will be used in both Chi Square tests. This means that on either test, ninety-five percent confidence can be assured that the hypothesis was not affirmed by chance.

In cases where the matrix projected zero employment due to rounding and no employment was found in the occupations through the survey, .5 was inserted as the matrix value. This should serve to maximize the possible computed Chi Square contributions and hence make the test conservative.

In an examination of the tables, it will be found that many of the cells have a zero value. Roscoe and Byers⁴ indicate that this will not affect the accuracy of the Chi Square Test if the average cell value is greater than five. The data meets this qualification.

Hypothesis 2

Hypothesis 2 which states "A table can be developed which will indicate the average error in projections of occupational profiles for various sized labor markets." will be tested using curvilinear regression analysis. If a curve that describes the relationship between the size of an estimate for a given occupation in the occupational profile and the error in the estimate expressed in number of workers can be determined and if the correlation (R) is sufficiently high to warrant the assumption of a fit of the curve to the

data, the hypothesis will be affirmed. Given affirmation of the hypothesis, a table will be generated using average number of workers in each occupation to determine percent of error in a local labor market.

Since agriculture census data were used to determine on-farm employment and must also be used to measure error, this occupation was eliminated from the regression analysis to insure that error was not underestimated at the higher end of the curve.

FOOTNOTES

¹Robert E. Scott, Occupational Surveys (Pittsburg, Kansas: Kansas State College at Pittsburg, 1967).

²John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences (New York: Holt, Rinehardt and Winston, Inc., 1969).

³George W. Snedecor and William G. Cochran, Statistical Methods (Ames, Iowa: The Iowa State University Press, 1967), p. 453.

⁴John T. Roscoe and Jackson A. Byers, "Chi Square Approximation of Multinomial and Selected Alternatives" (paper read at the Annual Educational Research Association Convention, March, 1970, Minneapolis, Minnesota).

Chapter 4

ANALYSIS

INTRODUCTION

This chapter presents (1) the statistical analysis and the disposition of the hypotheses examined in this investigation and (2) a discussion of various factors which contributed to the disposition of the hypotheses.

ANALYSIS AND DISPOSITION OF HYPOTHESIS 1

Hypothesis 1 which states "There will be a significant difference between the present occupational profile derived using the modified matrix approach and the occupational profile as determined by the employer survey," could not be affirmed or rejected. In Edwards County a significant difference was found in the two occupational profiles while in Wabaunsee County a significant difference could not be determined.

Significant contributors to the computed Chi Square value in Edwards County were the Machine Tool Operator criterion, the Machinists criterion, the Auto Attendants criterion and the Salesworkers criterion. In the case of the Machine Tool Operator criterion, six workers were projected and 40 were identified by survey. For Machinists, 34 workers were projected and eight were identified by survey. There were 126 Salesworkers projected while only 70 were identified by survey while eight Auto Attendants were projected and 24 were identified by survey. It should be noted that if Machinists and Machine Tool Operators were group as Machinist Trade, the calculated Chi Square value would be well under the tabular Chi Square value.

The results of the statistical analysis for Edwards County were the following. The null hypothesis that there was no significant difference between the occupational profile derived from the matrix and the occupational profile determined by the survey was rejected on the basis of a computed Chi Square value of 196.78 and a tabular Chi Square value of 162.883 for the .05 level of significance. See Table 4 for the cell values and calculations used to derive the computed Chi Square value.

TABLE 4
CHI SQUARE ANALYSIS DATA TABLE FOR EDWARDS COUNTY

OCCUPATION	(A) OBSERVED FREQUENCY FROM MATRIX	(B) OBSERVED FREQUENCY FROM SURVEY	(C) TOTAL OB- SERVED IN ROW	(D) EXPECTED FREQUENCY FROM MATRIX	(E) EXPECTED FREQUENCY FOR SURVEY	(F) CHI SQUARE CONTRIBUTION FROM MATRIX	(G) CHI SQUARE CONTRIBUTION FROM SURVEY	(H) TOTAL CON- TRIBUTION FOR ROW
	X	Y	A+B	A.C/N	B.C/N	(A-D) ² /D	(B-D) ² /E	F+G
Engineer, Aero	.5	0.	.5	.27	.23	.18	.23	.41
Engineer, Chemical	.5	0.	.5	.27	.23	.18	.23	.41
Engineer, Civil	4.	0.	4.	2.12	1.88	1.67	1.88	3.55
Engineer, Elec.	3.	1.	4.	2.12	1.88	.37	.41	.78
Engineer, Ind.	2.	0.	2.	1.06	.94	.83	.04	1.77
Engineer, Mech.	4.	4.	8.	4.24	3.76	.01	.01	.02
Engineer, Metal	.5	0.	.5	.27	.23	.18	.23	.41
Engineer, Mining	.5	0.	.5	.27	.23	.18	.23	.41
Chemist	1.	1.	2.	1.06	.94	.00	.00	.00
Ag. Scientist	.5	0.	.5	.27	.23	.18	.23	.41
Bio. Scientist	.5	0.	.5	.27	.23	.18	.23	.41
Geologists	.5	0.	.5	.27	.23	.18	.23	.41
Mathematician	.5	0.	.5	.27	.23	.18	.23	.41
Physicist	.5	0.	.5	.27	.23	.18	.23	.41
Draftsman	4.	13.	17.	9.03	7.97	2.80	3.17	5.97
Surveyors	0.	5.	5.	2.65	2.35	2.65	2.99	5.64
Air Traffic Controller	.5	0.	.5	.27	.23	.18	.23	.41

TABLE 4 (CONT)

Radio Operator	.5	0.	.5	.27	.23	.18	.23	.41
Dentist	2.	2.	4.	2.12	1.88	.01	.01	.02
Dietician	.5	0.	.5	.27	.23	.18	.23	.41
Nurses, R.N.	13.	27.	40.	21.24	18.76	3.20	3.62	6.82
Optometrists	0.	1.	1.	.53	.47	.53	.60	1.13
Osteopaths	.5	0.	.5	.27	.23	.18	.23	.41
Pharmacists	3.	5.	8.	4.24	3.76	.36	.41	.77
Physicians	3.	3.	6.	3.19	2.81	.01	.01	.02
Psychologists	1.	0.	1.	.53	.47	.42	.47	.89
Tech, Med. & Dental	4.	4.	8.	4.24	3.76	.01	.01	.02
Vets.	3.	1.	4.	2.12	1.88	.37	.41	.78
Teachers	79	63	142.	75.40	66.60	.17	.19	.36
Economists	.5	0.	.5	.27	.23	.18	.23	.41
Statisticians	.5	0.	.5	.27	.23	.18	.23	.41
Accountants	9.	2.	11.	5.84	5.16	1.71	1.94	3.65
Airplane Pilot	1.	1.	2.	1.06	.94	.00	.00	.00
Architects	.5	0.	.5	.27	.23	.18	.23	.41
Artists & Entertainer	0.	2.	2.	1.06	.94	1.06	1.19	2.25
Clergymen	9.	14.	23.	12.21	10.79	.84	.95	1.79
Designers	1.	0.	1.	.53	.47	.42	.47	.89
Editors and Reporters	0.	2.	2.	1.06	.94	1.06	1.19	2.25
Lawyers and Judges	6.	6.	12.	6.37	5.63	.02	.02	.04
Librarians	4.	3.	7.	3.72	3.28	.02	.02	.04
Personnel Workers	1.	1.	2.	1.06	.94	.00	.00	.00
Photographers	.5	0.	.5	.27	.23	.18	.23	.41
Social & Welfare	3.	3.	6.	3.19	2.81	.01	.01	.02
Conductors	.5	0.	.5	.27	.23	.18	.23	.41
Creditmen	1.	0.	1.	.53	.47	.42	.47	.89
Postmasters & Asst.	3.	5.	8.	4.24	3.76	.36	.41	.77
Steno. Typists	65.	63.	128.	67.96	60.04	.13	.15	.28

TABLE 4 (CONT)

Office Mach. Oper.	9.	2.	11.	5.84	5.16	1.71	1.94	3.65
Accounting Clerk	10.	11.	21.	11.15	9.85	.12	.13	.25
Bookkeepers, Hand	18.	9.	27.	14.34	12.67	.94	1.06	2.00
Bank Tellers	5.	3.	8.	4.24	3.76	.14	.15	.29
Cashiers	22.	18.	40.	21.24	18.67	.03	.03	.06
Mall Carriers	11.	9.	20.	10.62	9.38	.01	.02	.03
Postal Clerks	9.	10.	19.	10.09	8.91	.12	.13	.25
Ship & Rec Clerks	3.	7.	10.	5.31	4.69	1.00	1.14	2.14
Telephone Oper.	6.	1.	7.	3.72	3.28	1.40	1.58	2.98
Salesworkers	126.	70.	196.	104.7	91.93	4.59	5.23	9.82
Carpenters	5.	6.	11.	5.84	5.16	.12	.14	.26
Brickmasons	1.	0.	1.	.53	.47	.42	.47	.89
Cement & Concrete	.5	0.	.5	.27	.23	.18	.23	.41
Electricians	4.	2.	6.	3.19	2.81	.21	.23	.44
Excavating Mach. Op.	4.	1.	5.	2.65	2.35	.69	.78	1.47
Painters & Paper hangers	5.	1.	6.	3.19	2.81	1.03	1.17	2.20
Plasterers	.5	0.	.5	.27	.23	.18	.23	.41
Plumbers & Pipe Fitters	4.	6.	10.	5.31	4.69	.32	.37	.69
Roofers & Slaters	.5	0.	.5	.27	.23	.18	.23	.41
Structural Metal Workers	.5	0.	.5	.27	.23	.18	.23	.41
Machinists	34.	8.	42.	22.3	19.7	6.14	6.95	13.09
Blacksmiths	.5	0.	.5	.27	.23	.18	.23	.41
Boilermakers	.5	0.	.5	.27	.23	.18	.23	.41
Heat Treaters	0.	1.	1.	.53	.47	.53	.60	1.13
Millwright	.5	0.	.5	.27	.23	.18	.23	.41
Molders, Metal	2.	0.	2.	1.06	.94	.83	.94	1.77
Pattern Makers	.5	0.	.5	.27	.23	.18	.23	.41
Rollers & Roll Hands	.5	0.	.5	.27	.23	.18	.23	.41
Sheet Metal Workers	4.	0.	4.	2.12	1.88	1.67	1.88	3.55
Tool & Diemakers	6.	4.	10.	5.31	4.69	.09	.10	.19
Compositors	0.	3.	3.	1.59	1.41	1.59	1.79	3.38

TABLE 4 (CONT)

Electrotypers	.5	0.	.27	.23	.18	.23	.41
Engravers	.5	0.	.27	.23	.18	.23	.41
Photo Engraver	.5	0.	.27	.23	.18	.23	.41
Pressmen	0.	2.	1.06	.94	1.06	1.19	2.25
Linemen	15.	7.	11.68	10.32	.94	1.07	2.01
Locomotive Eng.	.5	0.	.27	.23	.18	.23	.41
Locomotive Firemen	.5	0.	.27	.23	.18	.23	.41
Airplane Mech.	.5	0.	.27	.23	.18	.23	.41
Motor Veh. Mech.	20.	18.	20.18	17.82	.00	.00	.00
Office Machine Mech.	1.	0.	.53	.47	.42	.47	.89
Radio & TV Mech.	1.	2.	1.59	1.41	.22	.25	.47
RR & Car Shop Mech.	.5	0.	.27	.23	.18	.23	.41
Bakers	.5	0.	.27	.23	.18	.23	.41
Cabinet Makers	.5	0.	.27	.23	.18	.23	.41
Cranemen	1.	0.	.53	.47	.42	.47	.89
Glaziers	0.	1.	.53	.47	.53	.60	1.13
Jewelers	0.	3.	1.89	1.41	1.59	1.79	3.38
Loom Fixers	.5	0.	.27	.23	.18	.23	.41
Opticians	.5	0.	.27	.23	.18	.23	.41
Inspectors, Log & Lbr.	.5	0.	.27	.23	.18	.23	.41
Upholsterers	3.	0.	1.59	1.41	1.25	1.41	2.66
Drivers, Bus & Truck	50.	35.	45.13	39.87	.53	.59	1.12
Deliverymen	14.	10.	12.74	11.26	.12	.14	.26
Brakemen	.5	0.	.27	.23	.18	.23	.41
Power Sta. Oper.	0.	1.	.53	.47	.53	.60	1.13
Furnacemen	5.	0.	.27	.23	.18	.23	.41
Heaters, Metal	.5	0.	.27	.23	.18	.23	.41
Welders	13.	8.	9.56	8.44	1.24	1.40	2.64
Assemblers A	2.	5.	3.72	3.28	.80	.90	1.70
Assemblers B	7.	8.	7.96	7.04	.12	.13	.25
Inspectors B	2.	0.	1.06	.94	.83	.94	1.77

TABLE 4 (CON'T)

Machine Tool Op. B	6.	40.	46.	24.42	21.58	13.89	15.72	29.61
Electroplaters	0.	1.	1.	.53	.47	.53	.60	1.13
Electroplaters Help.	0.	1.	1.	.53	.47	.53	.60	1.13
Knitters & Loopers	.5	0.	.5	.27	.23	.18	.23	.41
Spinners	.5	0.	.5	.27	.23	.18	.23	.41
Weavers	.5	0.	.5	.27	.23	.18	.23	.41
Sewers	.5	0.	.5	.27	.23	.18	.23	.41
Asbestos Ins.	.5	0.	.5	.27	.23	.18	.23	.41
Attendants, Auto	8.	24.	32.	16.99	15.01	4.76	5.38	10.14
Blasters	.5	0.	.5	.27	.23	.18	.23	.41
Laundry & Dry Cln.	5.	3.	8.	4.24	3.76	.14	.15	.29
Meat Cutters	2.	2.	4.	2.12	1.88	.01	.01	.02
Firemen	6.	0.	6.	3.19	2.81	2.48	2.81	5.29
Guards	3.	0.	3.	1.59	1.41	1.25	1.41	2.66
Policemen & Detective	9.	7.	16.	8.50	7.50	.03	.03	.06
Bartenders	2.	2.	4.	2.12	1.88	.01	.01	.02
Cooks	29.	27.	56.	29.73	26.27	.02	.02	.04
Counter & Fountain	6.	4.	10.	5.31	4.69	.09	.10	.19
Waiters & Waitresses	33.	22.	5.5	29.20	25.80	.49	.56	1.05
Airline Stewardess	.5	0.	.5	.27	.23	.18	.23	.41
Attendant, Inst.	17.	27.	44.	23.36	20.64	1.73	1.96	3.69
Charwomen, Cleaners	4.	7.	11.	5.84	5.16	.58	.67	1.25
Practical Nurses	5.	2.	7.	3.72	3.28	.44	.50	.94
Laborers	53.	35.	88.	46.72	41.28	.84	.96	1.80
Farmers & Farm Wks.	425.	429.	854.	453.43	400.57	1.78	2.02	3.80

N = 2479.5 df. = 134 $\Sigma A = 1316.5$ $\Sigma B = 1163$ $\chi^2_c = 196.78$ $\chi^2_T = 162.883$

Significant contributors to the computed Chi Square value for Wabsunsee County were the Workers in Arts and Entertainment and Salesworkers. In the case of Workers in Arts and Entertainment, 33 were projected and zero were identified by the survey. It should be noted that this error could be traced back to an error in the SIC classifications in the source data. For Salesworkers, 126 were projected while 66 were identified by survey.

The results of the statistical analysis for Wabaunsee County were the following. The null hypothesis that there was no significant difference between the occupational profile derived from the matrix and the occupational profile determined by the survey could not be rejected on the basis of a computed Chi Square value of 161.720 and a tabular Chi Square value of 162.883 for the .05 level of significance. See Table 5 for the cell values used to derive the computed Chi Square value.

ANALYSIS AND DISPOSITION OF HYPOTHESIS 2

Hypothesis 2 which states "A table can be developed which will indicate the average error in projections of occupational profiles for various sized labor markets," was affirmed subject to certain limitations. Probably the most serious limitations are that the rationale from which the table was developed depends on (1) extrapolation of a curvilinear regression equation and (2) the assumption that projections will have a similar proportion of error in urban situations and rural situations. An additional limitation is that the average error found in occupational profile projections for a given sized labor market is estimated on the basis of the average error of the average projection for that labor market.

With respect to the first limitation, extrapolation of the curvilinear regression equation was terminated well before an inflection point on the equation was reached. The second and third limitations could not be circumvented within the parameters of this study.

The rationale used to develop the table or error for various sized labor markets is based on a curve which associates a certain amount of error with a certain sized occupational profile projection. To determine the equation of the curve a curvilinear regression analysis of the size of the projection versus the size of the error was performed. (Note: See Table 6 for the values and calculations used in the regression analysis.)

TABLE 5

CHI SQUARE ANALYSIS DATA TABLE FOR WABAUNSEE COUNTY

OCCUPATION	(A) OBSERVED FREQUENCY FROM MATRIX	(B) OBSERVED FREQUENCY FROM SURVEY	(C) TOTAL OBSERVED IN ROW	(D) EXPECTED FREQUENCY FROM MATRIX	(E) EXPECTED FREQUENCY FOR SURVEY	(F) CHI SQUARE CONTRIBUTION FROM MATRIX	(G) CHI SQUARE CONTRIBUTION FROM SURVEY	(H) TOTAL CON- TRIBUTION FOR ROW
	A+B	A.C/N	B.C/N	(A-D) ² /D	(B-D) ² /E	F+G		
Engineers, Aero	.5	0.	.27	.23	.18	.23	.41	.41
Engineers, Chemical	.5	0.	.27	.23	.18	.23	.41	.41
Engineers, Civil	2.	1.	1.61	1.39	.09	.11	.20	.20
Engineers, Elec.	1.	0.	.54	.46	.39	.46	.85	.85
Engineers, Ind.	.5	0.	.27	.23	.18	.23	.41	.41
Engineers, Mech.	1.	0.	.54	.46	.39	.46	.85	.85
Engineers, Metal	.5	0.	.27	.23	.18	.23	.41	.41
Engineers, Mining	.5	0.	.27	.23	.18	.23	.41	.41
Chemist	2.	0.	1.07	.93	.81	.93	1.74	1.74
Ag. Scientist	1.	1.	1.07	.93	.00	.00	.00	.00
Bio. Scientist	.5	0.	.27	.23	.18	.23	.41	.41
Geologist	.5	0.	.27	.23	.18	.23	.41	.41
Mathematician	.5	0.	.27	.23	.18	.23	.41	.41
Physicist	.5	0.	.27	.23	.18	.23	.41	.41
Draftsmen	1.	0.	.54	.46	.39	.46	.86	.86
Surveyors	.5	0.	.27	.23	.18	.23	.41	.41
Air Traffic Controller	.5	0.	.27	.23	.18	.23	.41	.41
Radio Operator	.5	0.	.27	.23	.18	.23	.41	.41

TABLE 5 (CONT')

Dentist	2.	1.	3.	1.61	1.39	.09	.11	.20
Dietician	.5	0.	.5	.27	.23	.18	.23	.41
Nurses, R. N.	13.	6.	19.	10.20	8.80	.77	.89	1.66
Optometrists	0.	1.	1.	.54	.46	.54	.63	1.17
Osteopaths	.5	0.	.5	.27	.23	.18	.23	.41
Pharmacists	3.	3.	6.	3.22	2.78	.01	.02	.03
Physicians	3.	2.	5.	2.68	2.32	.04	.04	.08
Psychologists	1.	1.	2.	1.07	.93	.00	.00	.00
Tech, Med. & Dental	4.	3.	7.	3.77	3.23	.01	.02	.03
Vets.	4.	1.	5.	2.68	2.32	.65	.75	1.40
Teachers	153.	107.	260.	139.54	120.46	1.30	1.50	2.80
Economists	.5	0.	.5	.27	.23	.18	.23	.41
Statisticians	.5	0.	.5	.27	.23	.18	.23	.41
Accountants	7.	0.	7.	3.77	3.24	2.78	3.24	6.02
Airplane Pilots & Nav.	1.	0.	1.	.54	.46	.39	.46	.85
Architects	.5	0.	.5	.27	.23	.18	.23	.41
Workers in Arts & Ent.	33.	0.	33.	17.71	15.29	13.20	15.29	28.49
Clergymen	11.	11.	22.	11.80	10.19	.05	.06	.11
Designers	.5	0.	.5	.27	.23	.18	.23	.41
Editors	0.	1.	1.	.54	.46	.54	.63	1.17
Lawyers and Judges	4.	2.	6.	3.22	2.78	.19	.22	.41
Librarians	4.	3.	7.	3.77	3.24	.01	.02	.03
Personnel & Labor Rel.	2.	0.	2.	1.07	.93	.81	.93	1.74
Photographers	.5	0.	.5	.27	.23	.18	.23	.41
Social & Welfare	3.	3.	6.	3.22	2.78	.01	.02	.03
Conductors, RR	.5	0.	.5	.27	.23	.18	.23	.41
Creditmen	1.	0.	1.	.54	.46	.39	.46	.85
Postmaster & Asst.	3.	4.	7.	3.77	3.24	.16	.18	.34
Steno. Typist	61.	50.	111.	59.57	51.43	.03	.04	.07
Office Mach. Oper.	6.	2.	8.	4.29	3.71	.68	.79	1.47
Accounting Clerks	9.	3.	12.	6.44	5.56	1.01	1.18	2.19

TABLE 5 (CONT')

Bookkeepers, Hand	17.	18.	35.	18.78	16.22	.17	.20	.37
Bank Tellers	4.	9.	13.	6.98	6.02	1.27	1.48	2.75
Cashiers	5.	6.	11.	5.90	5.10	.14	.16	.30
Mail Carriers	11.	6.	17.	9.12	7.88	.39	.45	.84
Postal Clerks	9.	6.	15.	8.05	6.95	.11	.13	.24
Shipping & Rec. Clks.	2.	1.	3.	1.61	1.39	.09	.11	.20
Telephone Oper.	4.	1.	5.	2.68	2.32	.65	.75	1.40
Salesworkers	126.	66.	192.	103.05	88.50	4.91	5.72	10.63
Carpenters	11.	3.	14.	7.51	6.49	1.62	1.88	3.50
Brickmasons	1.	0.	1.	.54	.46	.39	.46	.85
Cement & Concrete	.5	0.	.5	.27	.23	.18	.23	.41
Electricians	3.	4.	7.	3.77	3.23	.16	.18	.34
Excavating Mach. Oper.	3.	4.	7.	3.77	3.23	.16	.18	.34
Painters & Paperhangers	5.	0.	5.	2.68	2.32	2.01	2.32	4.33
Plasterers	6.	3.	9.	4.83	4.17	.28	.33	.61
Plumbers & Pipefitters	.5	0.	.5	.27	.23	.18	.23	.41
Roofers & Slaters	.5	0.	.5	.27	.23	.18	.23	.41
Structural Metal	.5	0.	.5	.27	.23	.18	.23	.41
Machinists	2.	0.	2.	1.07	.93	.81	.93	1.74
Blacksmiths	.5	0.	.5	.27	.23	.18	.23	.41
Boilermakers	.5	0.	.5	.27	.23	.18	.23	.41
Heat Treaters	.5	0.	.5	.27	.23	.18	.23	.41
Millwrights	.5	0.	.5	.27	.23	.18	.23	.41
Molders, Metal	.5	0.	.5	.27	.23	.18	.23	.41
Pattern Makers	0.	1.	1.	.54	.46	.54	.63	1.17
Rollers	.5	0.	.5	.27	.23	.18	.23	.41
Sheetmetal Workers	.5	0.	.5	.27	.23	.18	.23	.41
Tool & Die Makers	.5	0.	.5	.27	.23	.18	.23	.41
Compositors	.5	0.	.5	.27	.23	.18	.23	.41
Electrotypers	0.	1.	1.	.54	.46	.54	.63	1.17
Engravers	.5	0.	.5	.27	.23	.18	.23	.41

TABLE 5 (CON'T)

Photo engravers	0.	1.	1.	1.	54	.46	.54	.63	1.17
Pressmen	0.	1.	1.	1.	.54	.46	.54	.63	1.17
Linemen	.5	0.	.5	.5	.27	.23	.18	.23	.41
Locomotive Eng.	.5	0.	.5	.5	.27	.23	.18	.23	.41
Locomotive Firemen	.5	0.	.5	.5	.27	.23	.18	.23	.41
Airplane Mech.	2.	0.	2.	17.	1.07	.93	.81	.93	1.74
Motor Veh. Mech.	7.	10.	17.	9.12	9.12	7.88	.49	.57	1.06
Office Mach. Mech.	.5	0.	.5	.27	.27	.23	.18	.23	.41
Radio & TV Mech.	.5	0.	.5	.27	.27	.23	.18	.23	.41
RR & Car Shop Mech.	.5	0.	.5	.27	.27	.23	.18	.23	.41
Bakers	.5	0.	.5	.27	.27	.23	.18	.23	.41
Cabinetmakers	1.	1.	2.	1.07	1.07	.93	.00	.00	.00
Cranemen	1.	1.	2.	1.07	1.07	.93	.00	.00	.00
Glaziers	.5	0.	.5	.27	.27	.23	.18	.23	.41
Jewelers	2.	0.	2.	1.07	1.07	.93	.81	.93	1.74
Loom Fixers	.5	0.	.5	.27	.27	.23	.18	.23	.41
Opticians	.5	0.	.5	.27	.27	.23	.18	.23	.41
Inspector, Log & Lbr.	.5	0.	.5	.27	.27	.23	.18	.23	.41
Upholsters	.5	0.	.5	.27	.27	.23	.18	.23	.41
Drivers, Bus & Truck	56.	58.	114.	61.18	61.18	52.82	.44	.51	.95
Deliverymen	11.	11.	22.	11.81	11.81	10.19	.06	.06	.12
Brakemen	.5	0.	.5	.27	.27	.23	.18	.23	.41
Power Station Opr.	.5	0.	.5	.27	.27	.23	.18	.23	.41
Furnacemen	.5	0.	.5	.27	.27	.23	.18	.23	.41
Heaters, Metal	.5	0.	.5	.27	.27	.23	.18	.23	.41
Welders	3.	2.	5.	2.68	2.68	2.32	.04	.04	.08
Assemblers, Metal Wk. A	1.	0.	1.	.54	.54	.46	.39	.46	.85
Assemblers B	.5	0.	.5	.27	.27	.23	.18	.23	.41
Inspectors B	.5	0.	.5	.27	.27	.23	.18	.23	.41
Machine Tool Opr. B	1.	0.	1.	.54	.54	.46	.39	.46	.85
Electroplaters	.5	0.	.5	.27	.27	.23	.18	.23	.41

TABLE 5 (CONT')

Electroplaters helper	.5	0.	.5	.27	.23	.18	.23	.41
Knitters, Loopers, Etc.	.5	0.	.5	.27	.23	.18	.23	.41
Spinners	.5	0.	.5	.27	.23	.18	.23	.41
Weavers	.5	0.	.5	.27	.23	.18	.23	.41
Sewers	.5	0.	.5	.27	.23	.18	.23	.41
Asbestos, Ins.	.5	0.	.5	.27	.23	.18	.23	.41
Attendants	8.	43.	51.	27.37	23.62	.12	.12	.24
Blasters	.5	0.	.5	.27	.23	.18	.23	.41
Laundry	2.	2.	4.	2.15	1.85	.01	.01	.02
Meat Cutters	7.	7.	14.	7.51	6.49	.03	.03	.06
Firemen	8.	0.	8.	4.29	3.71	3.21	3.71	6.92
Guards	2.	0.	2.	1.07	.93	.81	.93	1.74
Policemen	6.	9.	15.	8.05	6.95	.52	.60	1.12
Bartenders	2.	4.	6.	3.22	2.78	.46	.54	1.00
Cooks	38.	48.	86.	46.16	39.84	1.44	1.67	3.11
Counter & Fountain Wks.	9.	5.	14.	7.51	6.49	.30	.34	.64
Waiters	39.	22.	61.	32.24	28.26	1.20	1.39	2.59
Airline St.	.5	0.	.5	.27	.23	.18	.23	.41
Attendant, Inst.	19.	45.	64.	34.45	29.65	1.14	1.32	2.64
Charwomen	4.	12.	16.	8.59	7.41	2.45	2.84	5.29
Janitors	40.	21.	61.	32.74	28.26	1.61	1.87	3.48
Nurses, Practical	5.	5.	10.	5.37	4.63	.03	.03	.06
Laborers	79.	50.	129.	69.23	59.77	1.38	1.60	2.98
Farmers & Farm Wks.	758.	761.	1519.	815.24	703.76	4.02	4.66	8.68

$$N = 3140.5 \quad \Sigma A = 1685.5 \quad \Sigma B = 1455 \quad \chi^2_C = 161.72 \quad \chi^2_T = 162.883$$

Table 6

CURVILINEAR REGRESSION ANALYSIS DATA TABLE

OCCUPATION	Y	X ₁	X ₂	Y ²	X ₁ ²	X ₂ ²	X ₁ Y	X ₂ Y	X ₁ X ₂
Engineer, Aero	.5	.5	.25	.25	.25	.06	.25	.12	.12
Engineer, Chemical	.5	.5	.25	.25	.25	.06	.25	.12	.12
Engineer, Civil	4.	4.	16.	16.	16.	256.	16.	64.	64.
Engineer, Elec.	2.	3.	9.	4.	9.	81.	6.	18.	27.
Engineer, Ind.	2.	2.	4.	4.	4.	16.	4.	8.	8.
Engineer, Mech.	0.	4.	16.	0.	16.	256.	0.	0.	64.
Engineer, Metal	.5	.5	.25	.25	.25	.06	.25	.12	.12
Engineer, Mining	.5	.5	.25	.25	.25	.06	.25	.12	.12
Chemist	.5	.5	.25	.25	.25	1.	.25	.12	.12
Ag. Scientist	0.	1.	1.	0.	1.	.06	0.	0.	1.
Biological Scientist	.5	.5	.25	.25	.25	.06	.25	.12	.12
Geologist	.5	.5	.25	.25	.25	.06	.25	.12	.12
Mathematician	.5	.5	.25	.25	.25	.06	.25	.12	.12
Physicist	.5	.5	.25	.25	.25	.06	.25	.12	.12
Draftsman	9.	4.	16.	81.	16.	256.	36.	2204.	64.
Surveyors	5.	0.	0.	25.	0.	.06	0.	0.	0.
Air Traffic Controller	.5	.5	.25	.25	.25	.06	.25	.12	.12
Radio Operator	.5	.5	.25	.25	.25	.06	.25	.12	.12
Dentist	0.	2.	4.	0.	4.	16.	0.	0.	8.
Dietician	.5	.5	.25	.25	.25	.06	.25	.12	.12
Nurses, R.N.	14.	13.	169.	196.	169.	28561.	182.	2366.	2197.
Optometrists	1.	0.	0.	1.	0.	0.	0.	1.	0.
Osteopaths	.5	.5	.25	.25	.25	.06	.25	.12	.12
Pharmacists	2.	3.	9.	.4	9.	81.	6.	18.	27.
Physicians	0.	3.	9.	.0	9.	81.	0.	0.	27.
Psychologists	1.	1.	1.	1.	1.	1.	1.	1.	1.

Table 6 (Continued)

Tech, Med. & Dental	0.	4.	4.	0.	4.	16.	0.	0.	16.	0.	0.	16.
Vets.	2.	3.	9.	4.	9.	81.	6.	18.	27.	6.	18.	27.
Teachers	16.	79.	4241.	256.	4241.	17986081.	1264.	67856.	335039.	1264.	67856.	335039.
Economists	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12
Statisticians	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12
Accountants	17.	9.	81.	40.	81.	6561.	63.	567.	729.	63.	567.	729.
Airplane Pilot	0.	1.	1.	0.	1.	1.	0.	0.	1.	0.	0.	1.
Architects	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12
Artists	2.	0.	0.	4.	0.	0.	0.	0.	0.	0.	0.	0.
Clergymen	5.	9.	81.	25.	81.	1.	45.	405.	729.	45.	405.	729.
Designers	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Editors	2.	0.	0.	4.	0.	0.	0.	0.	0.	0.	0.	0.
Lawyers	0.	6.	36.	0.	36.	0.	0.	0.	216.	0.	0.	216.
Librarians	1.	4.	16.	1.	16.	256.	4.	16.	64.	4.	16.	64.
Personnel Wks.	0.	1.	1.	0.	1.	1.	0.	0.	1.	0.	0.	1.
Photographers	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12
Social & Welfare	0.	3.	9.	0.	9.	81.	0.	0.	27.	0.	0.	27.
Conductors	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12
Credit men	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Postmasters	2.	3.	9.	4.	9.	81.	6.	18.	27.	6.	18.	27.
Steno. Typists	2.	65.	4225.	4.	4225.	17850625.	130.	8450.	274625.	130.	8450.	274625.
Office Machine Op.	7.	9.	81.	49.	81.	6561.	63.	567.	729.	63.	567.	729.
Accounting clerk	1.	10.	100.	1.	100.	1000.1	10.	100.	1000.	10.	100.	1000.
Bookkeepers	9.	18.	324.	81.	324.	104976.	162.	2916.	5832.	162.	2916.	5832.
Bank Tellers	2.	5.	25.	4.	25.	625.	10.	50.	125.	10.	50.	125.
Cashiers	4.	22.	484.	16.	484.	234256.	88.	1936.	10648.	88.	1936.	10648.
Mail Carriers	11.	11.	121.	4.	121.	14641.	22.	242.	1331.	22.	242.	1331.
Postal Clerks	1.	9.	81.	1.	81.	6561.	9.	81.	729.	9.	81.	729.
Shipping & Rec.	4.	3.	9.	16.	9.	1296.	12.	36.	27.	12.	36.	27.
Telephone	5.	6.	36.	25.	36.	1296.	30.	180.	216.	30.	180.	216.
Sales workers	56.	126.	15876.	1.	15876.	2520473.	7056.	889056.	2000376.	7056.	889056.	2000376.
Carpenters	1.	5.	25.	1.	25.	625.	5.	25.	125.	5.	25.	125.
Brick Masons	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Cement & Concrete	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12
Electricians	2.	4.	16.	4.	16.	256.	8.	32.	64.	8.	32.	64.
Excavating Mach.	3.	4.	16.	9.	16.	256.	12.	48.	64.	12.	48.	64.
Painters	4.	5.	25.	16.	25.	625.	20.	100.	125.	20.	100.	125.
Plasterers	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12
Plumbers	2.	4.	16.	4.	16.	256.	8.	32.	64.	8.	32.	64.
Roofers	.5	.5	.25	.25	.25	.06	.25	.12	.12	.25	.12	.12

Table 6 (Continued)

Structural Mtl.	.5	.25	.25	.25	.25	.06	.25	.12	.12
Mechanists	26.	34.	1156.	676.	1156.	1336386.	£84.	30056.	39304.
Blacksmiths	.5	.5	.25	.25	.25	.06	.25	.12	.12
Boilermakers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Heat treaters	1.	0.	0.	1.	0.	0.	0.	0.	0.
Millwrights	.5	.5	.25	.25	.25	.06	.25	.12	.12
Molders	2.	2.	4.	4.	4.	16.	4.	8.	8.
Pattern makers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Rollers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Sheet metal wks.	4.	4.	16.	16.	16.	256.	16.	64.	64.
Tool & Die makers	2.	6.	36.	4.	36.	1296.	12.	72.	216.
Compositors	3.	0.	0.	9.	0.	0.	0.	0.	0.
Electrotypers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Engravers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Photo Engravers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Pressmen	2.	0.	0.	4.	0.	0.	0.	0.	0.
Linemen	8.	15.	225.	64.	225.	50625.	120.	2000.	3375.
Locomotive Eng.	.5	.5	.25	.25	.25	.06	.25	.12	.12
Locomotive Firemen	.5	.5	.25	.25	.25	.06	.25	.12	.12
Airplane Mech.	.5	.5	.25	.25	.25	.06	.25	.12	.12
Motor Veh. Mech.	2.	20.	400.	4.	400.	160000.	40.	800.	8000.
Office Mach. Mech.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Radio & TV Mech.	1.	1.	1.	1.	1.	1.	1.	1.	1.
RR & Car Shop Mech.	.5	.5	.25	.25	.25	.06	.25	.12	.12
Bakers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Cabinet makers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Cranemen	1.	1.	1.	1.	1.	1.	1.	1.	1.
Glaziers	1.	0.	0.	1.	0.	0.	0.	0.	0.
Jewelers	3.	0.	0.	9.	0.	0.	0.	0.	0.
Loom fixers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Opticians	.5	.5	.25	.25	.25	.06	.25	.12	.12
Inspectors, lumber	.5	.5	.25	.25	.25	.06	.25	.12	.12
Upholsters	3.	3.	9.	9.	9.	81.	9.	27.	27.
Drivers, bus & truck	15.	50.	2500.	225.	2500.	6250000.	750.	37500.	125000.
Deliverymen	4.	14.	196.	16.	196.	38416.	56.	784.	2744.
Breakmen	.5	.5	.25	.25	.25	.06	.25	.125	.125
Power Station Opr.	1.	0.	0.	1.	0.	0.	0.	0.	0.
Furnacemen	.5	.5	.25	.25	.25	.06	.25	.225	.125
Heaters metal	.5	.5	.25	.25	.25	.06	.25	.125	.125
Welders	8.	13.	169.	64.	169.	28561.	104.	1352.	2197.
Assemblers, Class A	3.	2.	4.	9.	4.	16.	6.	12.	8.
Assemblers, Class B	1.	7.	49.	1.	49.	2401.	7.	49.	343.

Table 6 (Continued)

Inspectors, Class B	2.	2.	4.	4.	4.	16.	4.	1224.	8.	8.
Machine Tool Opr.	34.	6.	36.	1156.	36.	1296.	204.	1224.	216.	216.
Electroplaters	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.
Electroplaters helper	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.
Knitters	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Spinners	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Weavers	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Sewers	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Asbestos Inst.	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Attendants, Auto	16.	8.	64.	256.	64.	4096.	128.	1024.	512.	512.
Blasters	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Laundry & Dry cleaning	2.	5.	25.	4.	25.	625.	10.	50.	125.	125.
Meat Cutters	0.	2.	4.	0.	4.	16.	0.	0.	8.	8.
Firemen	6.	6.	36.	36.	36.	1296.	36.	216.	216.	216.
Guards	3.	3.	9.	9.	9.	81.	9.	27.	27.	27.
Police	2.	9.	81.	4.	81.	6561.	18.	162.	729.	729.
Bartenders	0.	2.	4.	0.	4.	16.	0.	0.	8.	8.
Cooks	2.	29.	841.	4.	841.	707281.	58.	1682.	24389.	24389.
Counter & fountain workers	2.	6.	36.	4.	36.	1296.	12.	72.	216.	216.
Waiters & Waitresses	11.	33.	1089.	121.	1089.	1185921.	363.	11979.	35937.	35937.
Airline Stewardess	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Attendants, hosp.	10.	17.	289.	100.	289.	83521.	170.	2890.	4913.	4913.
Charwomen, cleaners	3.	4.	16.	9.	16.	256.	12.12	88.	64.	64.
Janitors	4.	33.	1089.	16.	1089.	1185921.	132.	4356.	35937.	35937.
Practical nurses	3.	5.	25.	9.	25.	625.	15.	75.	125.	125.
Laborers	18.	53.	2809.	324.	2809.	7890481.	954.	50562.	148877.	148877.
WARAUNSEE										
Engineer, Aero	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Engineer, Chemical	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Engineer, Civil	1.	2.	4.	1.	4.	16.	2.	4.	8.	8.
Engineer, Elec.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Engineer, Ind.	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Engineer, Mech.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Engineer, Metal	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Engineer, Mining	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Chemist	2.	2.	4.	4.	4.	16.	4.	8.	8.	8.
Aq. Scientist	0.	1.	1.	0.	1.	1.	0.	0.	1.	1.
Biological Scientist	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Geologist	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Mathematician	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125
Physicist	.5	.5	.25	.25	.25	.06	.25	.125	.125	.125

Table 6 (Continued)

[illegible]

Table 6 (Continued)

Shipping and Rec.	1.	2.	4.	1.	4.	16.	2.	4.	8.
Telephone Opr.	3.	4.	16.	9.	16.	256.	12.	54.	64.
Salesworkers	60.	126.	15876.	3600.	15876.	252047376.	7560.	952560.	2000376.
Carpenters	8.	11.	121.	64.	121.	14641.	88.	968.	1331.
Brick masons	1.	1.	1.	1.	1.	1.	1.	1.	1.
Cement	.5	.5	.25	.25	.25	.06	.25	.125	.125
Electricians	1.	3.	9.	1.	9.	81.	3.	9.	27.
Excavating Mach. Opr.	1.	3.	9.	1.	9.	81.	3.	9.	27.
Painters	5.	5.	25.	25.	25.	625.	25.	125.	125.
Plasterers	3.	6.	36.	9.	36.	1296.	18.	108.	216.
Plumbers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Roofers	.5	.5	.25	.25	.25	.06	.25	.12	.12
Structural Metal	.5	.5	.25	.25	.25	.06	.25	.125	.125
Machinists	2.	2.	4.	4.	4.	16.	4.	8.	8.
Blacksmiths	.5	.5	.25	.25	.25	.06	.25	.125	.125
Boilermakers	.5	.5	.25	.25	.25	.06	.25	.125	.125
Millwright	.5	.5	.25	.25	.25	.06	.25	.125	.125
Molders	.5	.5	.25	.25	.25	.06	.25	.125	.125
Pattern makers	1.	0.	0.	1.	0.	0.	0.	0.	0.
Rollers	.5	.5	.25	.25	.25	.06	.25	.125	.125
Sheet Metal Wks.	.5	.5	.25	.25	.25	.06	.25	.125	.125
Tool & Die Makers	.5	.5	.25	.25	.25	.06	.25	.125	.125
Compositors	.5	.5	.25	.25	.25	.06	.25	.125	.125
Electrotypers	1.	0.	0.	1.	0.	0.	0.	0.	0.
Engravers	.5	.5	.25	.25	.25	.06	.25	.125	.125
Photoengravers	1.	0.	0.	1.	0.	0.	0.	0.	0.
Pressmen	1.	0.	0.	1.	0.	0.	0.	0.	0.
Linenen	.5	.5	.25	.25	.25	.06	.25	.125	.125
Locomotive Eng.	.5	.5	.25	.25	.25	.06	.25	.125	.125
Firemen	.5	.5	.25	.25	.25	.06	.25	.125	.125
Airplane Mech.	2.	2.	4.	4.	4.	16.	4.	8.	8.
Motor Veh. Mech.	3.	7.	49.	9.	49.	2401.	21.	147.	343.
Office Mach. Mech.	.5	.5	.25	.25	.25	.06	.25	.125	.125
Radio & TV Mech.	.5	.5	.25	.25	.25	.06	.25	.12	.12
R. R. Car Mech.	.5	.5	.25	.25	.25	.06	.25	.12	.12

Table 6 (Continued)

Bakers	.5	.25	.25	.25	.25	.06	.25	.12	.12
Cabinetmakers	0.	1.	0.	1.	1.	1.	0.	0.	1.
Cranemen	0.	1.	0.	1.	1.	1.	0.	0.	1.
Glaziers	.5	.25	.25	.25	.25	.06	.25	.12	.12
Jewelers	2.	4.	4.	4.	4.	16.	4.	8.	8.
Loom fixers	.5	.25	.25	.25	.25	.06	.25	.12	.12
Opticians	.5	.25	.25	.25	.25	.06	.25	.12	.12
Inspectors, Lox and Lumber	.5	.25	.25	.25	.25	.06	.25	.12	.12
Upholsters	.5	.25	.25	.25	.25	.06	.25	.12	.12
Drivers, Bus & Truck	2.	3136.	4.	3136.	3136.	9834496.	112.	6272.	175616.
Deliverymen	0.	121.	0.	121.	121.	14641.	0.	0.	1331.
Breakmen	.5	.25	.25	.25	.25	.06	.25	.12	.12
Power Station Opr.	.5	.25	.25	.25	.25	.06	.25	.12	.12
Furnacemen	.5	.25	.25	.25	.25	.06	.25	.12	.12
Heaters, metal	.5	.25	.25	.25	.25	.06	.25	.12	.12
Welders	1.	9.	1.	9.	9.	81.	3.	9.	27.
Assemblers A	1.	1.	1.	1.	1.	1.	1.	1.	1.
Assemblers B	.5	.25	.25	.25	.25	.06	.25	.12	.12
Inspectors B	.5	.25	.25	.25	.25	.06	.25	.12	.12
Machine Tool Opr.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Electroplater	.5	.25	.25	.25	.25	.06	.25	.12	.12
Electroplater helper	.5	.25	.25	.25	.25	.06	.25	.12	.12
Knitters	.5	.25	.25	.25	.25	.06	.25	.12	.12
Spinners	.5	.25	.25	.25	.25	.06	.25	.12	.12
Weavers	.5	.25	.25	.25	.25	.06	.25	.12	.12
Sewers	.5	.25	.25	.25	.25	.06	.25	.12	.12
Asbestos Inst.	.5	.25	.25	.25	.25	.06	.25	.12	.12
Attendants, Auto	35.	64.	1225.	64.	64.	4096.	280.	2240.	512.
Blasters	.5	.25	.25	.25	.25	.06	.25	.12	.12
Laundry and Dry cleaning	0.	4.	0.	4.	4.	16.	0.	0.	8.
Meat Cutters	0.	49.	0.	49.	49.	2401.	0.	0.	343.
Firemen	8.	64.	64.	64.	64.	4096.	64.	512.	512.
Guards	2.	4.	4.	4.	4.	16.	4.	8.	8.
Police	3.	36.	4.	36.	36.	1296.	18.	108.	216.
Bartenders	2.	4.	4.	4.	4.	16.	4.	8.	8.
Cooks	10.	1444.	100.	1444.	1444.	2085136.	380.	14440.	54872.
Counter & fountain workers	4.	81.	16.	81.	81.	6561.	36.	244.	729.

Table 6 (Continued)

Waiters	17.	34.	1521.	289.	1521.	2313441.	663.	25857.	59319.
Airline Stewardess	.5	.5	.25	.25	.25	.06	.25	.12	.12
Attendants, Inst.	26.	19.	361.	676.	361.	130321.	494.	9386.	6859.
Charwomen	8.	4.	16.	64.	16.	256.	32.	128.	64.
Janitors	19.	40.	1600.	361.	1600.	2560000.	760.	30400.	64000.
Practical nurses	0.	5.	25.	0.	25.	625.	0.	0.	125.
Laborers	29.	79.	6241.	841.	6241.	38950081.	2291.	180989.	493039.

$$\Sigma Y = 124 \quad \Sigma X_1 = 293 \quad \Sigma X_2 = 20487.50 \quad \Sigma Y^2 = 7896.75 \quad \Sigma X_1^2 = 20487.50 \quad \Sigma X_2^2 = 266023658.36 \quad \Sigma X_1 Y = 8590.50$$

$$\Sigma X_2 Y = 996491.725 \quad \Sigma X_1 X_2 = 2237318.725$$

The curve appears to fit the data well with $R = .803$ and the standard error of estimate = 4.55. The equation which was derived from the curvilinear regression analysis was:

$$Y = .7721 + .368X - .00019X^2$$

The inflection point of this equation is at $X = 968.42$ and possibly extrapolation of the data should end before $X = 900$. In any case, this should be considered when using the data found in the table of error for various sized labor markets.

The next step in the rationale for developing the table was to translate the size of the error for a given projection into a percent of error by dividing the size of the projection into the size of the associated error. For example, if the projection was for 600 workers and average error expressed in number of workers was 153.17 as found using the derived equation, then the average error expressed in percent would be 25.52.

The last step in determining the values found in the table of error for various sized labor markets was to multiply the number of workers times the number of occupations in the matrix. This in essence makes the number of workers the average number projected for all occupations within that labor market.

Table 7 summarizes the data on error estimated for occupational projections and associated labor markets by number of workers. An additional feature of this table is the expression of the average size of manpower demand prejection versus error estimates. This is also based on averages, i.e., the expected annual demand for workers in Kansas' labor force will be approximately four percent of the present total number of workers and hence an occupation with 600 workers would have a demand for 24 new workers annually.

SUMMARY

Hypothesis 1 was neither affirmed nor rejected since no significant difference was found between the matrix profile and the acutal profile in Wabaunsee County while a significant difference was found between the matrix profile and the actual in Edwards County. Although no significant difference was found in Wabaunsee County, there was one profile error which sheds light on possible error contributions, i.e., a need for Workers in the Arts and

Table 7

ERROR ANALYSIS FOR PROFILE PROJECTIONS AND ASSOCIATED
LABOR MARKET AND MANPOWER NEED ESTIMATES

MEAN PERCENT ERROR IN PROFILE AND ASSOCIATED NEEDS AND LABOR MARKET	ASSOCIATED AVERAGE ANNUAL MANPOWER DEMAND (BASED ON AVERAGE DEMAND)	ASSOCIATED SIZE OF LABOR MARKET (BASED ON THE ASSUMPTION THAT THE PROFILE PROJECTION IS AN AVERAGE SIZED PRO- JECTION	SIZE OF OCCUPATIONAL PROJECTION (MATRIX ESTIMATE OF NUMBER OF WORKERS IN A GIVEN OCCUPATION)
37.38	2	8100	50
35.67	4	16200	100
34.46	6	24300	150
33.38	8	32400	200
32.35	10	40500	250
31.35	12	48600	300
30.36	14	56700	350
29.39	16	64800	400
28.42	18	72900	450
27.45	20	81000	500
26.48	22	89100	550
25.50	24	97200	600
24.56	26	105300	650
23.61	28	113400	700
22.65	30	121500	750
21.69	32	129600	800
20.74	34	137700	850
19.74	36	145800	900

Entertainment was projected while none existed. This error could be traced back to the source data which had a SIC code error. Although a significant difference was found between profiles in Edwards County, the difference could be attributed to the Machinist and Machine Tool Operator classifications, one of which was greatly overestimated and one of which was greatly underestimated. This mismatch was caused by the classification of employees of one firm. If Machinists and Machine Tool Operators had been grouped into a single category, there would have been no significant difference found between profiles in Edwards County.

Using curvilinear regression to match a curve to projection size versus size of error data, a table of estimated error for various sized projections and associated manpower needs projections and labor market sizes was developed. The data seemed to fit the curve well since R was calculated to equal .803. Error ranged from 37.38 for smaller projections to 19.74 for larger projections.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

This chapter presents conclusions based on the findings presented in Chapter 4 and recommendations based on these conclusions.

CONCLUSIONS

The conclusions presented here are of three types. Type One Conclusions relate to the accuracy of the modified matrix technique while Type Two Conclusions relate to the sources of error and Type Three Conclusions relate to the evaluation techniques used in this study.

Type One Conclusions

1. There is a large degree of error in profile estimates for small (under 3,000 job) labor markets.
2. The larger the labor market, the less the percent of error in the projections.
3. Some occupations such as Salesworkers seem to be overestimated in small labor markets while other occupations such as Auto Service Station Attendants appear to be underestimated.
4. The matrix technique may have trouble discriminating between closely related occupations such as Machinists and Machine Tool Operators.
5. The modified matrix technique tends to overestimate employment in small rural labor markets.
6. Accurate SIC coding is extremely important in small labor markets where a single miscoded firm can cause extreme error.

Type Two Conclusions

1. At least part of the profile error can be attributed to error in the SIC coding of base data.

2. At least occasionally, the matrix technique will have difficulty discriminating between closely related occupations causing one of the occupations to be overestimated and the other to be underestimated.

3. Wabaunsee and Edwards Counties were extremely rigorous tests for the modified matrix technique since Wabaunsee has an economy which is strictly agricultural and agricultural service oriented and Edwards County has a single firm which can, by itself, distort the profile.

4. Rural residents commute to urban centers for many goods and services which will distort the rural profile.

5. There is probably better coverage of rural businesses by Dun and Bradstreet which cause overestimates of rural employment when state adjustment factors are applied.

6. In small firms, occupations overlap with workers functioning in several occupational areas. As an example, the owner of a small retail store may be classified as a manager but will probably also function as a bookkeeper, salesclerk, etc.

Type Three Conclusions

1. Evaluations such as that used to examine Hypothesis 1 in this study should be directed towards investigations of source of error because it leads to very little useful information about degree of error.

2. Because of the critical need to know about error parameters for the modified matrix technique extrapolation of a linear regression equation is justified until further research on larger labor markets can be conducted.

3. Since both counties involved in this study were of rural nature, an additional county which contains an urban center should be examined to determine rural-urban effect on the projections.

RECOMMENDATIONS

The following recommendations are divided into two classifications, i.e., recommendations pertaining to the use of the modified matrix technique data and recommendations pertaining to future research.

Type One Recommendations

1. Data on small labor markets should be used with extreme care and

any user should be thoroughly familiar with limitations of the data.

2. If possible, planning should be based on labor markets consisting of several counties, with confidence in the data increasing as the labor market size increases.

3. When possible, planning should be based on clusters of related occupations as accuracy increases as detail decreases.

4. When extremely unusual or impossible predictions are found in the data, the SIC coding of the source data should be examined.

Type Two Recommendations

1. A study of a larger labor market which includes a significant urban center should be conducted to determine if the linear regression equation does in fact predict the error found in projections.

SUMMARY

In summary, the evaluation of the modified matrix presented in this study indicates that the technique can be used to plan vocational and technical education programs for small labor markets but that when doing such planning, limitations of the data must be taken into account.

Confidence in the data can be increased by either grouping related occupations into clusters or by increasing the size of the planning area to include a larger labor market (several counties for example).

Part 2

AN ANALYSIS OF THE ACCURACY OF MODIFIED MATRIX
PROJECTED OCCUPATIONAL PROFILES FOR
URBAN LABOR MARKETS

R. B. Daniels

Chapter 6

INTRODUCTION

BACKGROUND

The 1968 Amendments to the 1963 Vocational Education Act (P.L. 90-576) require that vocational and technical training programs be designed to prepare workers for jobs that either exist presently or will exist in the near future.¹ This implies that programs should only be implemented in occupational areas where manpower needs have been identified. Before this requirement can be met, a system for projecting manpower needs must be developed to provide valid data to be utilized by vocational and technical education program planners.

In 1971, the Division of Vocational Education of the Kansas State Department of Education contracted with Kansas State University for the development of a management information system which would generate data on manpower needs annually.² The developmental project was designated "The Kansas Manpower Utilization System for Training" (K-MUST). The original plan was to conduct an employer survey which would be updated annually; however, this plan was abandoned when it became clear that costs of such a system would exceed the funds available.³ Representatives of the Division of Vocational Education of the State Department of Education asked the project director to explore other approaches which might be used to produce adequate manpower needs data at a lower cost.⁴

The technique which was finally selected was a modified version of the Bureau of Labor Statistics (BLS) Matrix Method A. In this approach, employment by Standard Industrial Classification (Department of Commerce classifications) is broken into employment by occupation using ratios developed by the Bureau of Labor Statistics (BLS). Employment by Standard Industrial Classification can be obtained from Dun and Bradstreet, Inc. or, in some instances, from the local Employment Security Division. Once the employment-by-occupation data has been generated, manpower expansion and

replacement needs are calculated on the basis of BLS factors. All resulting data is adjusted in terms of the state occupational profile and history of the county labor market.⁵

Although the modified matrix approach appears to be logically sound, there is some question as to the accuracy of a technique which applies national ratios and factors to local situations. It is impossible to examine the accuracy of the manpower needs projections since the projection period lies in the future; however, it is possible to make a partial examination of the technique by looking at the occupational profile generated by the modified matrix method in light of an actual occupational profile. Downing⁶ conducted a study on error found in the occupational profile projections produced by the modified matrix technique in the summer of 1972. His findings indicated that error was related to the size of projections with larger projections having a smaller percent of error. He considered his study to be limited in that he examined small labor markets which might cause an overestimate of error. He recommended:⁷

A study of a larger labor market which includes a significant urban center should be conducted to determine if the curvilinear regression equation (developed in his study) does in fact predict the error found in (profile) projections.

Mr. John Snyder, Assistant Commissioner of Education for Vocational Education, for the State of Kansas, agreed that the study of a county which contains a significant urban center should be conducted since the data will influence vocational and technical education planning across the state.⁸

STATEMENT OF THE PROBLEM

This study will attempt to answer the question, "Does the curvilinear regression equation developed by Downing to predict the error in the modified matrix occupational profiles accurately reflect error in occupational profile projections for larger labor markets?"

PURPOSE OF THE STUDY

The purpose of the study is to examine the manpower profile estimates generated by the modified matrix technique in general and to check the error

prediction equation developed by Downing in particular. If findings indicate the Downing error prediction equation is valid for larger urban areas, then planners can have additional confidence in the data; while if the error equation is found to be unsatisfactory for larger urban areas, then it can be modified.

NEED FOR THE STUDY

Planning, evaluating and funding of vocational and technical education programs in Kansas must be based, in part, on the manpower needs projections generated by the modified matrix technique. It is essential, therefore, that these projections be as accurate as possible. In addition, a knowledge of the expected degree of error in the projections will allow the planner to base his decisions on a range instead of a point estimate.

Downing has conducted a study which establishes an error factor. This factor is based on data from small labor markets and probably over-estimates the size of error. This study will expand the work Downing has done to include larger urban labor markets and will modify the error equation if necessary. If the expected error factor does decrease as expected, then planners, evaluaters, and other school administrators will be able to perform their jobs with more confidence in the data on which many of their decisions must be based.

ASSUMPTIONS

The analysis and interpretation of data performed in this study is based on the following assumptions.

1. Employers will be able to define the occupations of their employees in terms used by the modified matrix approach.
2. Employers will be willing to cooperate in providing data on the number and type of workers in their organization.
3. Economic conditions will not significantly affect the degree of error found in labor market profiles generated by the modified matrix approach.

DELIMITATIONS

This study is subject to the following delimitations.

1. Only one county will be surveyed and compared with the modified matrix technique profile projections.
2. Estimated employment will be compared with present employment; however, projected job openings cannot be compared with actual job openings for the projection period. This means that this study will provide only a partial evaluation of the modified matrix technique. It should be noted, however, the procedure used to develop the Downing error prediction equation is also used in this study and hence the error prediction equation can be tested fully.

HYPOTHESES

This study will test two hypotheses; i.e., one related to the accuracy of Downing's equation and one related to the development of an error prediction equation for larger urban labor market profile projections.

Hypothesis 1

This study will evaluate the generalizability of Downing's equation to an urban situation by testing the following hypothesis.

The actual error found in occupational profile projections generated by the modified matrix technique will be similar to the error predicted by Downing's equation.

Hypothesis 2

This study will evaluate the need for an urban error prediction equation by testing the following hypothesis.

A scale table which will indicate the accuracy of the modified matrix profile projections on the basis of percent urban population of the forecast area and size of profile projection can be developed.

FOOTNOTES

¹U.S. Congress, Vocational Education Amendments of 1968, Public Law 90-576, 90th Cong., 1968 (Washington: Government Printing Office, 1968).

²K-MUST contract number 1231, State Department of Education, Division of Vocational Education.

³K-MUST contract modification, letter from State Department of Education, Division of Vocational Education, October 18, 1971.

⁴Ibid.

⁵James L. Harris and Robert E. Scott, "Techniques Used to Project Manpower Needs" (unpublished paper, Kansas State University, 1972).

⁶Jimmie Lee Downing, "A Comparison of Federal Matrix Manpower Needs Projections and Employer Survey Manpower Needs Projections for Small Labor Markets." (unpublished Doctor's dissertation, Kansas State University, 1972).

⁷Ibid., p. 66.

⁸Statement by John E. Snyder, Assistant Commissioner, Vocational Education, Kansas State Department of Education, personal interview, February 13, 1972.

Chapter 7

BACKGROUND INFORMATION

INTRODUCTION

This chapter is concerned with background information which provides a foundation for the study. Chapter 7 has two objectives: (1) an investigation of background information that identifies, defines and explains key concepts used in this study, and (2) a review of similar research and its relevance to this study.

DEFINITIONS

The following important terms are defined as they apply to this study.

Actual Error

Actual error is the absolute value of the number of workers by occupation classification projected by the modified BLS Matrix technique minus the number of actual workers by occupation classification determined by the survey.

Bureau of Labor Statistics (BLS)

The Bureau of Labor Statistics is a component of the Department of Labor which has the primary responsibility for the technical development and statistical adequacy of the matrix system used to project national manpower needs.¹

Bureau of Labor Statistics Occupation by Industry Matrix (BLS Matrix)

The BLS Matrix is a set of employment and expansion ratios pertaining to various industries and occupations within industries. The matrix covers 116 industrial clusters and 162 occupational clusters which represent the entire economy.²

Downing Equation (The)

An equation which expresses the relationship between the size of estimated occupational profiles and the size of the expected error in the estimate. The equation is expressed as follows:

$$Y = .7721 + .368X - .00019X^2$$

where Y is the size of error and X is the size of projection.³

Dictionary of Occupational Titles (The)

The Dictionary of Occupational Titles (DOT) is a current inventory of occupations within the American economy and as such is the most comprehensive single source of occupational information available. The third edition of the DOT, prepared by the U.S. Department of Labor, is published in a two-volume set. Volume I, entitled Definitions of Titles, is a dictionary of occupations which provides a basic source of occupational language and job descriptions. Volume II, entitled Occupational Classification, contains the classification structure and the coding system used by the Department of Labor for gathering, compiling, and disseminating employment information.⁴

Estimated Error

Estimated error is the error estimate produced by the Downing Equation for various profile projection sizes.

Forecast Area

Is a specified location with certain geographical boundaries designated for the purpose of predicting or estimating manpower needs.

Kansas Manpower Utilization System for Training (K-MUST)

Is a management information system used by the Kansas State Department of Education, Division of Vocational Education. Its principle functions include the projection of manpower needs and supply for occupational forecast areas in Kansas.⁵

Labor Force

The Labor Force is the total number of workers available minus the size of the armed forces and assuming a national unemployment rate of three percent.⁶

Labor Market

The Labor Market is the total number of jobs available in the economy.⁷

Manpower Demand

Is the total number of measured or projected skilled persons needed during the time period under consideration, categorized according to specific skill, or "skill cluster."⁸

Manpower Development Training Act (1962)

A federal act administered by the Department of Labor and Department of Health, Education, and Welfare. The act provides for training of persons who are unemployed and underemployed as well as the retraining of persons who are displaced due to automation and technological change.⁹

Manpower Supply

Is the total number of measured or projected skilled persons available during the time period under consideration, categorized according to specific skill or "skill cluster" and the supply source where this skilled person is located.¹⁰

Occupational Clusters

Is a taxonomy of the total spectrum of occupations, classified into logically related groups on the basis of identical or similar elements or characteristics.¹¹

Occupational Outlook Handbook (The)

Is the Bureau of Labor Statistics' outstanding contribution to the training and guidance fields. Published biannually, the Handbook provides current and long-range information on occupations concerning 90 percent of the 16 million employed in professional, managerial, and technical occupations; nearly all of the 4.5 million sales workers; about half of the 10.7 million clerical workers; and about 40 percent of the 9.3 million service workers.¹²

Occupational Profile

The occupational profile is the number of workers in a labor force categorized by number of workers by occupational type.¹³

Occupational Survey

A form of occupational census, taken by personnel trained to determine the number of qualified workers in designated occupations in a specific geographic or economic area, and to evaluate the need for increasing or limiting the numbers available for employment in the occupations surveyed.¹⁴

Non-Farm Employment

Employment in any non-farm industry or business. This employment is not covered by the agricultural census conducted periodically by the Department of Agriculture.

Profile Estimate

The profile estimate is the number of workers by occupation in a forecast area as determined by using the modified matrix technique.

Profile Projection (Also referred to as workers within an occupation)

Profile projection is an estimate of occupational profile produced by the modified matrix approach.

Program Planners (Also referred to as Planners)

The planning process can be described as research, goal-setting, and plan formulation.¹⁵ In the context of this study, planning is a management tool used by vocational educators. It is the rational process of specifying the objectives of vocational programs determining the present attainment levels for those objectives, and selecting strategies. Planners are individuals involved in the planning process.

Projection Period

Projection period refers to the time frame under which manpower needs projections are made. For example, manpower needs projections for 1971 through 1976 would refer to the 1971-1976 projection period. Profile estimates for 1971 would refer to the 1971 projection period.

Standard Industrial Classification (SIC)

Is a system whereby each industry is assigned a code on the basis of

its major activity, which is determined by the product or group of products produced or handled, or services rendered. The structure of the system makes it possible to classify establishments by industry on a two digit, a three digit, or a four digit basis, according to the degree of detail in information which may be needed.¹⁶

Standard Metropolitan Statistical Area (SMSA)

Standard Metropolitan Statistical Area refers to a county or group of counties containing at least one city of 50,000 inhabitants or more, or "twin cities" with a combined population of at least 50,000. In addition to the county or counties, containing such a city or cities contiguous counties are included in the SMSA if they are essentially metropolitan in character and are socially and economically integrated with the central city or cities.¹⁷

State Plan for Vocational Education

The document submitted by the State Board for Vocational Education to the U.S. Office of Education describing the state's vocational education program. Includes policies followed by the state in maintaining, extending, and improving existing programs and establishing new programs to meet the intent of the Vocational Education Acts. Prerequisite for receiving federal funds under the acts.¹⁸

Technical Education

The branch of education devoted to instruction and training in occupations above the craftsman or trade level, but generally not professional in nature. Instruction may not be baccalaureate in content but is evaluated usually by credit criteria rather than by clock hour. The courses qualify persons for employment in paraprofessional positions and as technicians, engineering aids, and production specialists.¹⁹

Urban Counties

Urban counties, as defined in this study, include counties where the 1970 United States Census has identified 50 percent or more of the population in the county as living in one urban center containing more than 10,000 persons.

Vocational Education

Vocational or technical training or retraining which is given in schools or classes (including field or laboratory work and remedial or related academic and technical instruction incident thereto) under public supervision and control or under contract with a state board or local educational agency, and is conducted as part of a program designed to prepare individuals for gainful employment as semiskilled or skilled workers or technicians or subprofessionals in recognized occupations and new and emerging occupations, or to prepare individuals for enrollment in advanced technical programs, but excluding any program to prepare individuals for employment in occupations generally considered professional or which require a baccalaureate or higher degree.²⁰

Vocational Education Act of 1963

A law enacted to authorize federal grants to states to assist them to maintain, extend, and improve existing programs of vocational education, to develop new programs of vocational education, and to provide part-time employment for youths who need the earnings from such employment to continue their vocational training on a full-time basis so that persons of all ages in all communities of the states--those in high school, those who have completed or discontinued their formal education and are preparing to enter the labor market, those who have already entered the labor market but need to upgrade their skills or learn new ones, and those with special educational handicaps--will have ready access to vocational training or retraining which is of high quality, which is realistic in the light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interest, and ability to benefit from such training.²¹

Vocational Education Amendments of 1968

An act which amended all previous vocational education acts and repealed the Vocational Education Act of 1963. The declaration of purpose differed from the Vocational Education Act of 1963 in that those in post-secondary schools were specified among the groups which will have access to vocational training or retraining.²²

REVIEW OF RELATED LITERATURE

The past few years have witnessed a prominent interest in creating a viable technique for forecasting occupational job requirements.²³ This is partly due to the emphasis manpower legislation has placed on manpower needs and job opportunities data within the various acts. The Area Redevelopment Act of 1961 states that before any training courses could be approved, there had to be "reasonable expectation of employment" for the trainee upon completion of the course.²⁴ This concept is also found in the Manpower Development and Training Act of 1962,²⁵ the Vocational Education Act of 1963 and its Amendments of 1963.²⁶

The review presented here will (1) describe the major techniques used to forecast manpower needs in the United States today, (2) describe selected major research projects which have attempted to project manpower needs, (3) describe the Modified Matrix Technique used to project manpower needs in Kansas, and (4) describe the Downing study which partially evaluated the Modified Matrix technique.

MAJOR METHODS FOR DETERMINING MANPOWER NEEDS

There are six major methods of determining manpower needs for given labor markets. These techniques are (1) the Experimental Employer Needs Survey Technique (Area Skill Survey), (2) the Unfilled Job Openings - Occupational Outlook Handbook strategy, (3) the Leading Industries Experiment Approach, (4) the Bureau of Labor Statistics Matrix Approach, (5) the Econometric Approach, and (6) the Occupation by Population Approach.²⁷ Each of the six techniques or strategies for determining manpower needs have strengths and weaknesses.

Experimental Employer Needs Survey

The Experimental Employer Needs Survey is a refined modification of the Area Skills Survey Technique. The Area Skill Survey is conducted by means of a mail or personal interview instrument which asks individual employers to forecast their employee requirements for a projected period, taking into account both replacement and expansion needs.²⁸

When personal interviews are used to collect data, probes and other interview techniques can be employed to improve the quality of the data. Additionally, the number of occupations can be as extensive as resources will permit. Finally, data detail can be expanded.²⁹

On the other hand, the technique is costly and time consuming. It is based on a stratified random selection of firms and since no two firms are identical, stratification is often difficult. Also, many experts feel that employers cannot predict their manpower needs for long-range periods. Frequently, a personnel officer or some other subordinate official who does not know the long-range plans of the firm is designated to complete the questionnaire.³⁰

Unfilled Job Openings - Occupational Outlook Handbook

The Unfilled Job Openings - Occupational Outlook Handbook strategy uses data available from selected records of Employment Service Offices such as unfilled job openings in combination with routinely collected information from other federal and state agencies. Basic to the technique is the application of the Occupational Outlook Handbook forecasts of national trends in specific occupations.³¹

The technique's chief advantages are the economics of data gathering and the ease of repeating the analytical study at frequent intervals. The technique has certain deficiencies, however, since for some occupational areas, the Employment Service records may contain data which are neither adequate nor representative. In addition, the method has no real predictive devices related to labor demand in selected occupations in a given local area. A critical shortcoming is that job openings do not always indicate a shortage of workers, e.g., the jobs could be undesirable.³²

Leading Industry Experiment Approach

The Leading Industry Experiment Approach projects manpower demand by identifying and surveying firms which might be among the more progressive and whose occupational mix and projected employment trends might provide information useful for vocational education planning.³³

This technique is relatively inexpensive and quick and can be applied at the local level. The interview is open-ended and allows the interviewee

the opportunity to express his opinions extensively. On the negative side, the technique is designed for a limited industrial activity which employs all or a large proportion of the workers in the occupations to be studied.³⁴

Bureau of Labor Statistics (Area Projection Method A)

The Area Projection Method A is one of the alternative techniques of the Bureau of Labor Statistics Approach to the development of manpower needs projections. Using this technique estimates of area occupational requirements are made by applying 1960 and 1975 national industrial-occupational patterns to appropriate area industry employment estimates; summing the occupational totals; computing a change factor (1960-1975) for each occupation; and applying the change factors.³⁵

This technique is limited in that local projections are not possible in many cases, it is time consuming, it is relatively expensive and requires the services of an expert occupational analyst who is familiar with the forecast area. On the other hand, it has certain distinct advantages, foremost of which is its extremely well thought out predictive technique.³⁶

Econometric Methods

Econometric Methods of projecting manpower needs use data from comprehensive models of the national economy. In the United States most of the data is collected by the U.S. Bureau of the Census. Major components of the gross national product are projected into the future, providing estimates of the total demand for goods and services on an annual basis. These estimates of total products and services demand are translated into manpower needs by type of industry and occupation.³⁷

Time and cost factors are relatively favorable using this technique, especially with respect to large labor markets. Data are available from the Bureau of Census and the Bureau of Labor Statistics. Economists are needed to interpret and analyze data and manpower needs for sub-national labor markets are extremely difficult to predict using this technique.³⁸

Occupation by Population Approach

The Occupation by Population Approach uses factors based on past Census Reports to determine the number of certain types of workers per 1,000

population. For example, there might be 2.7 welders predicted for every 1,000 inhabitants in the forecast area.³⁹

This technique is surprisingly accurate for certain occupations in large labor markets. It is not appropriate for smaller labor markets and has no predictive device.

Most of the significant studies to date utilize the Area Skills Survey Technique or the Bureau of Labor Statistics Matrix Approach. The models selected to be discussed in this paper are the 1966 Roney-Braden Study, the 1969 Pennsylvania Study, the 1966 Michigan Study and the 1970 Occupational Training Information System (OTIS) Study.

In 1966 Oklahoma State University attempted to develop information for curriculum planners and data inputs for manpower forecasters in the electro-mechanical technology cluster. Their projections are based on a national sample and the technique used appears to be a mixture of the Leading Industry Experiment Approach and the Area Skills Survey Approach.⁴⁰

The sample was stratified by size (number of employees) and type of product, however, no effort to consider occupational homogeneity was made.⁴¹ David Kidder indicates that the demand data was probably questionable due to the total lack of workers in these occupations; hence, employer inability to determine manpower needs based on past experience.⁴²

In the Pennsylvania Study, Arnold applied the Bureau of Labor Statistics Change Factors (Matrix) to state level occupational distributions. Needs by year are filled in by employing straight line projections.⁴³

It is doubtful that Pennsylvania conforms to national trends and no attempt was made to regionalize the projections on an interstate basis. In addition, only a few occupations (less than thirty) were projected. On the positive side, however, this attempt was innovative and should be considered a forerunner of what will probably happen on the national scene in the future.⁴⁴

The Michigan study, an attempt to forecast occupational manpower needs over a period of fifteen years, was designed to develop estimates of future labor demands by industry, occupational, and educational attainments. They developed an occupational-educational matrix for the state using available data plus survey data.⁴⁵

The economic and sociological assumptions on which this study is based seem unrealistic. Michigan's economy will probably not remain unchanged for fifteen years. Furthermore, conversion to a curricular framework would be

required. It is clear that supply and demand by educational categories are not independent when computed by the occupational-educational matrix developed in this study.⁴⁶

The Occupational Training Information System (OTIS) utilizes the Area Skills Survey Approach to collect demand data. The Oklahoma Employment Security Commission does a complete statewide-industry-wide survey once every four years to set a data base. Industrial Coordinators survey specific industry sectors (manufacturing, service, etc.) in the intervening years. This data is used to update the base set by the Employment Security Commission.⁴⁷

The OTIS project has been called a system for the future in operation today. If theory and practice were synonymous, it would indeed be a significant solution to the problem of forecasting manpower needs. In practice, however, the approach proves to be extremely expensive. In addition, the data collected by the Industrial Coordinators is somewhat incomplete and frequently in error. Usually, the Employment Security Commission data is only slightly modified in light of the Industrial Coordinator data. The resultant effect is that demand data loses validity between base data periods. As a whole, however, the system is probably one of the best in operation today.⁴⁸

In 1971, the K-MUST Project at Kansas State University attempted to develop a manpower forecasting system which was reasonably accurate, inexpensive and quick. The general approach selected was a modification of the Bureau of Labor Statistics Technique. The Method A Approach was modified through the adjustment of national change factors relative to local situations. Also, instead of projecting from a fixed Census base year, projections are based on present employment by standard Industrial Classification.

A simplified explanation⁴⁹ of what takes place within the modified BLS Matrix approach is best represented by utilizing a flow chart. (See Figure 1).

In step 1 of the modified matrix technique, all employing organizations in the labor market are identified by SIC code and number of employees. The data on individual organizations is based on Dunn and Bradstreet Market Identifiers (R), Unemployment Insurance Accounts, Government Directories, Department of Agriculture studies, and other state-based studies. This data is accumulated into number of employees in a particular type of industry (SIC).

In step 2, the occupational profile is derived by breaking employment

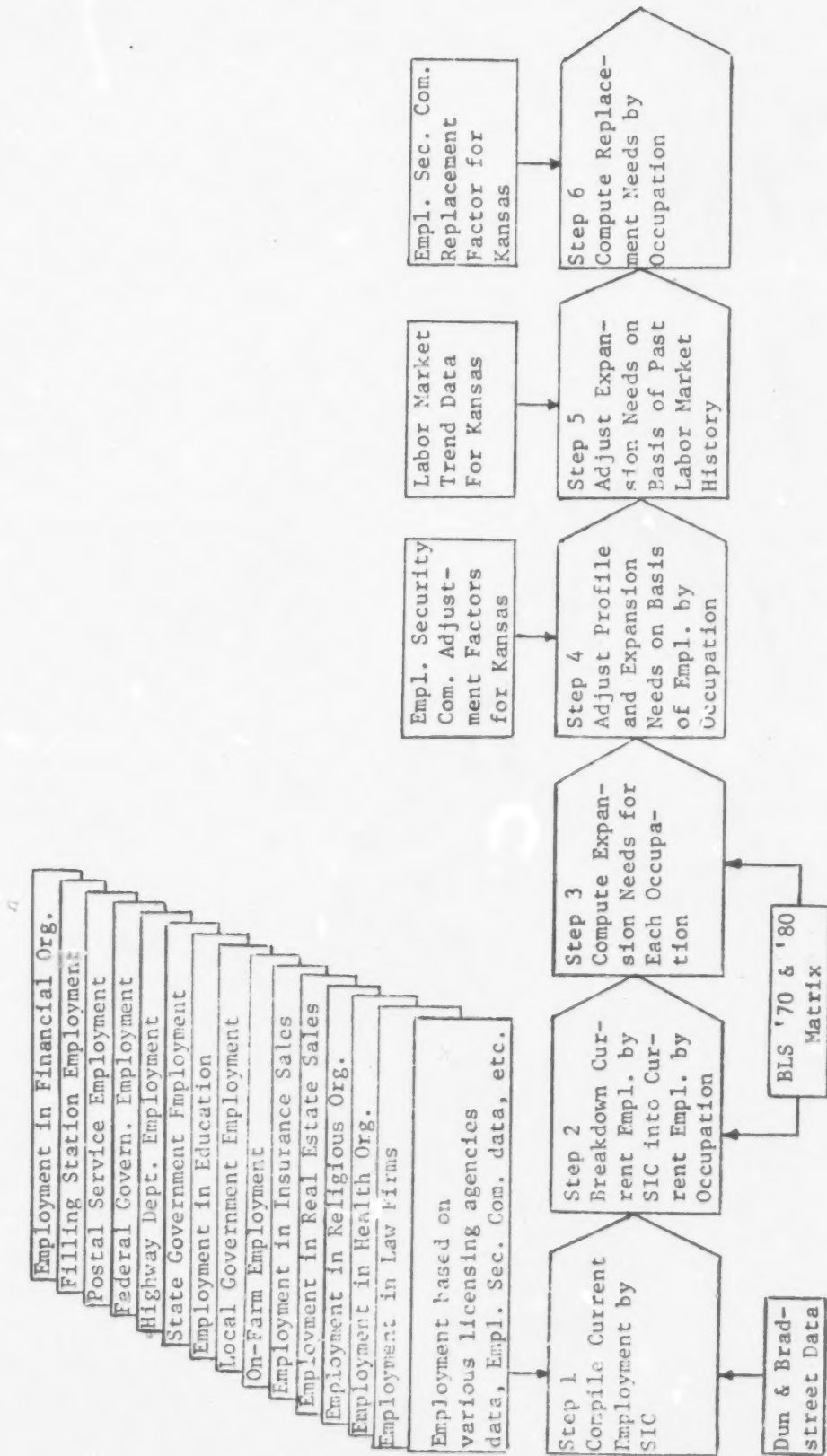


Figure 1. Flow Chart Depicting Procedures of the Modified Matrix Approach

by SIC code into employment by occupation utilizing percentages generated from the BLS 70-80 matrix.

In step 3, which is almost simultaneous with step 2, expansion needs for each occupation in each industry are computed using percentages from the matrix. The expansion needs for each occupation are then summed.

In step 4, both profile and expansion figures are adjusted on the basis of employment by occupation figures provided by the Kansas Security Commission. This is, in effect, adjusting profiles and expansion to the Kansas situation.

In step 5, the expansion needs are further adjusted to the local situation using local labor market trend data provided by the Employment Security Commission.

In step 6, replacement needs are calculated using percentage factors from the Employment Security Commission which are based on the job mobility of workers, the age of workers, and mortality statistics.

The accuracy of this approach was tested in the Downing study of 1972.⁵⁰ The study was designed to evaluate the modified matrix technique by comparing estimated present employment by occupation generated by the technique with actual employment by occupation determined by a 100 percent employer survey in two Kansas counties. The basic purpose of the study was to determine the size and source of error in manpower profile projections generated by the technique.

The Downing investigation was limited to the population of Kansas counties with small labor markets (less than three thousand workers). The nature of the matrix indicates that error is probably inversely associated with labor market size. Therefore, by selecting the smallest labor markets in Kansas, the error would be greatest.

Since the economy of Kansas varies greatly from east to west, the eastern counties being involved with manufacturing, mining, and small farm operations, and the western counties being involved principally with large farming operations, the counties with small labor markets were roughly divided into two subpopulations, i.e., eastern counties and western counties. A further refining of the two subpopulations of counties was achieved by eliminating the central Kansas counties which were difficult to classify as either eastern or western. Once the central Kansas counties were eliminated,

there were twelve eastern and thirty-three western counties with labor forces of less than three thousand workers. Next, one eastern county (Wabaunsee) and one western county (Edwards) were randomly selected to be the subjects of a 100 percent employer survey.

The interview instrument consisted of a listing of occupations and occupational clusters identical to those generated by the modified matrix. Space was provided to enter the number of employees in each occupation during the interview. The instrument was not open-ended since every occupation was classifiable under the structure used.

Every non-farm employer in Wabaunsee and Edwards counties was interviewed to determine how many workers were employed in the various occupations. On-farm data used in the study was obtained from the agricultural census conducted by the Department of Agriculture.

Using curvilinear regression to analyze survey and profile projection data, Downing attempted to develop an equation which would associate size of error with size of profile projection. The equation derived was $Y = .7721 + .368X - .00019X^2$, where X is the profile projection size and Y is the size of error. The equation seemed to fit the profile size-error size relationship since R was equal to .803. Displayed graphically (See Figure 2), it is observed that the increase in error size diminishes as the profile projection size increases.

When error size is translated into percent of error, the equation becomes $Y = \frac{.7721 + .368X - .00019X^2}{X}$. Displayed graphically in Figure 3, it can be seen that the percent of error decreases as projection size increases.

In occupations where manpower need is sufficiently large to support a training program, it was found that associated profile error is less than twenty percent.

Four major causes for error in the profiles produced by the modified matrix approach were identified in the Downing study.

The first source of error seemed to be the inability of the matrix to discriminate between closely related occupations. For example, in Edwards County, six machine tool operators and thirty-four machinists were identified by survey. If these and other related occupations had been grouped, error would have been reduced significantly.

The second source of error could be attributed to the nature of the counties surveyed (both had small labor markets). Salesworkers tended to be

FIGURE 2

ERROR SIZE/PROJECTION SIZE RELATIONSHIP
(WABAUNSEE AND EDWARDS COUNTIES)

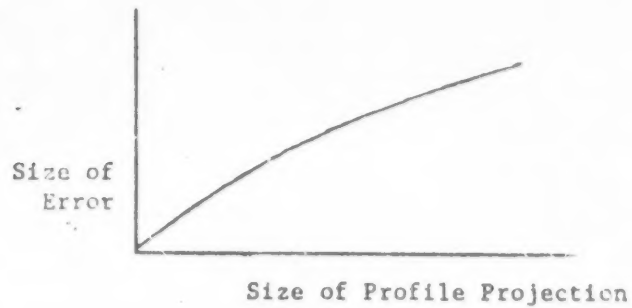
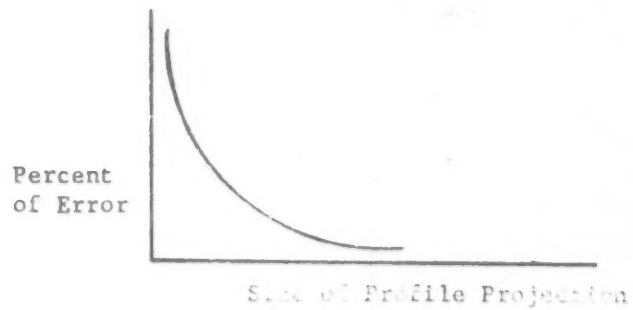


FIGURE 3

PERCENT OF ERROR/PROJECTION SIZE
(WABAUNSEE AND EDWARDS COUNTIES)



overestimated in these small counties. This difference indicates the possibility that small county residents may tend to purchase a number of their goods in surrounding urban centers, whereas they may tend to purchase most of their services at home and these same services require a greater percentage of service workers.

The third source of error, which could not logically be attributed to the matrix, was the fact that many workers in the small firms surveyed performed multiple functions. For example, a manager was often also a bookkeeper, a sales clerk and a custodian. In the survey, the worker was classified according to his major function. The matrix, of course, prorated the workers on the basis of functions to be performed.

The last source of error identified was in the input data. The importance of correct SIC coding was apparent when the matrix projected thirty-three workers in arts and entertainment in Wabaunsee County. This was a rather obvious error which could be attributed to miscoding of input data.

Downing arrived at the following conclusions concerning the accuracy of the modified matrix approach:

1. Error in the profile projections is related to the size of the projection with small projections having greater percent error than larger projections. Therefore, accuracy could be improved by grouping counties into regions.

2. Profile error will be less than twenty percent in most cases where manpower needs projections produced using the matrix are of a sufficient size to warrant vocational training programs.

3. Accuracy of the matrix projections can be improved by grouping related occupations.

4. Sales occupations tend to be overestimated and service occupations underestimated in small counties using the modified matrix approach.

5. Error in SIC codes caused a great deal of error in the matrix projections.

FOOTNOTES

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- ³¹James L. Harris and Robert E. Scott, op. cit.
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- ³⁴Ibid.
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- ⁴⁶David E. Kidder, op. cit.
- ⁴⁷James L. Harris and W. D. Frazier, op. cit.
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⁵⁰ Jimmie L. Downing, op. cit.

Chapter 8

PROCEDURES

INTRODUCTION

The purpose of this chapter is to describe the procedures, data and statistical methodology that were used to evaluate the hypotheses stated in Chapter 7 (see page 60).

POPULATIONS

There are two populations directly involved in this study. The first is the population of urban counties in Kansas. The second is the population of jobs by occupational type in these counties.

In this study, urban counties are those where the majority of people live in urban areas as defined by the 1970 United States Census.

The population of jobs by occupation (occupational profile) in the urban counties constitute the second population found in this study. The modified matrix technique projects an occupational profile of 162 jobs or job clusters for each county. This profile is inclusive of all employment in the labor market. For the purpose of this study, the "Farmer and Farm Laborer" classification will not be used since the Agricultural Census was used to develop this figure in the modified version of the matrix and hence the accuracy of the Census would be checked instead of the accuracy of the technique.

THE SAMPLE

Harvey County was selected to represent urban counties in this study. It was selected because (1) it is centrally located and hence has elements similar to western Kansas economies and elements similar to eastern Kansas economics¹, (2) it is located near a Standard Metropolitan Statistical Area (SMSA) and therefore is influenced by an exceptionally large (for Kansas)

urban concentration, (3) it is not part of the Standard Metropolitan Statistical Area and therefore is not a segment of a larger community, (4) it has a diversified economic base including representation from most major Standard Industrial Classification (SIC) categories as well as having extensive manufacturing elements, and (5) it has a labor force that is small enough to make a direct contact survey feasible and yet large enough to have urban characteristics.

The second sample (from the second population) consists of all employment (100 percent) in Harvey County as defined by the occupational groupings found in the modified matrix technique.

THE INSTRUMENT

The interview instrument (see Appendix B) was designed in the spring of 1972 by Downing in cooperation with the K-MUST staff. The instrument has been pretested and used in the Downing study and has proved to be a valid data gathering tool.² A copy of the instrument was used during each interview.

The first section of the form is for recording identification data on the firm being surveyed. Items include (1) name of organization, (2) mailing address, (3) representative being interviewed, (4) representative's title, (5) total number of employees, and (6) major activity (SIC).

The body of the instrument consists of three columns; i.e., one column contains a list of occupation and occupational cluster titles generated by the modified matrix technique, one column contains census occupation titles that correspond to the modified matrix technique titles and one column where the number of workers under each modified matrix technique job title could be recorded. The instrument is not open ended since the modified matrix technique occupational profile should cover all occupations.

DATA COLLECTION

The data collected for this study consists of the number of workers by occupation for all off-farm employers in Harvey County, Kansas. Each employer was visited to determine how many workers of each occupational type were employed by that organization.

From August 14, 1972, through August 18, 1972, 736 employers were surveyed in Harvey County. The survey was conducted by members of the K-MUST staff, members of the Central Kansas Area Vocational and Technical School staff and members of the staff of the Division of Vocational Education of the State Department of Education. These employers reported 9,413 (off-farm) workers in 119 different occupations or occupational clusters. Every effort was made to contact all off-farm employers in the county, and as far as can be determined, all were contacted. (Note: see Appendix C for a list of the employers contacted).

INTERVIEW TECHNIQUES

It should be noted that none of the 736 employers contacted refused to cooperate. The Central Kansas Area Vocational and Technical School staff had previously contacted the seven largest employing organizations in the county and these organizations had prepared employment rosters prior to being contacted by interviewers. In addition, the Newton (the county seat of Harvey County) newspaper had published a series of articles explaining the purposes of the survey and many employers were expecting the interviewers.

The interviews were conducted strictly in accord with the procedures and techniques outlined in Scott's Occupational Surveys.³ The success of the interviewers can probably be attributed to the adherence to this outline. A summary of the procedures and techniques used is as follows.

Step 1

Upon meeting the interviewee, the interviewer explained the subject and purpose of the study, explained that all employers in the county were being contacted and explained that the data was confidential as far as any specific reference to a given firm was concerned.

Step 2

The interviewer emphasized that participation in the interview was voluntary and that the survey was important to the people of Harvey County. He also indicated that the employer's answers to all questions were important to the survey results.

Step 3

The interviewer dressed in accord with the standards of the community. In this case, a dress shirt and tie with no coat was appropriate.

Step 4

The interview was conducted in the place of business and in private, if possible.

Step 5

The questionnaire was explained and the interviewee responded with the number and type of employees in his organization.

Step 6

Probes were used when responses were irrelevant, unclear or incomplete.

Step 7

Responses were recorded on the premises with the interviewee observing.

Step 8

The interviewee checked the form to insure that responses were accurate before the interviewer left the premises.

Step 9

The interviewer thanked the interviewee before he left the premises.

STATISTICAL TOOLS⁴

Two statistical tools were used to analyze the data in this study. Both tools are standard techniques normally found in statistics text books. Hypothesis 1 requires the use of linear regression analysis while hypothesis 2 requires the use of curvilinear regression analysis.

Linear regression analysis is an extremely useful tool for predicting the relationship between two variables. The relationship may be expressed as a line drawn on a scattergram or as a linear equation ($Y = bX + c$). The slope of the line gives an indication of the rate at which Y changes with change in X. In this case, Y will equal the actual error of a given profile projection while X will equal the estimated error in a given profile projection calculated from the Downing equation. The closer the slope of the

line is to +1 and the closer the line passes to the point (0,0) the more nearly a one to one correlation exists, i.e., there is no difference in the error in profile projections determined by survey and the error projections determined by Downing's equation. The relationship between the line derived by linear regression and the line described by the equation $Y = X$ describes the relationship between the two types of error in profile projections.

The problem is to calculate the "b" and the "c" in the linear regression equation. The "b" constant is calculated with the following formula.

$$b = \frac{\sum XY - \frac{(\sum X)(\sum Y)}{N}}{\sum X^2 - \frac{(\sum X)^2}{N}}$$

The "c" constant is calculated with the following formula.

$$c = \bar{Y} - b\bar{X}$$

In these equations,

1. X is an actual error in a profile projection,
2. Y is the estimated error in a profile projection,
3. N is the number of occupations or occupational clusters,
4. $\bar{X}$ is the mean of the X's, and
5. $\bar{Y}$ is the mean of the Y's.

Another consideration that must be taken into account is "How good does the data fit the linear regression equation?" To answer this question, the standard error of the estimate must be calculated.

The standard error of the estimate is calculated with the following formula.

$$SE = \frac{\sqrt{\sum Y^2 - \frac{(\sum Y)^2}{N}}}{\sqrt{N - 2}} \quad 1 - \frac{\sum XY - \frac{(\sum X)(\sum Y)}{N}}{\sum X^2 - \frac{(\sum X)^2}{N} \quad \sum Y^2 - \frac{(\sum Y)^2}{N}}$$

Curvilinear regression is a special case of bivariate linear regression where the second independent variable is a function of the first independent variable. In the case presented in this study, scattergram evidence indicates that the greater the size of the profile projections, the less the percent of

error which suggests the relationship between the size of projection and the degree of error may be forecasted by some second degree polynomial. If this is the case, then the first independent variable (number projected by matrix) is related to the second independent variable (number projected by matrix squared) in the manner expressed in the following function.

$$x_1^2 = x_2$$

It should be noted that Snedecor and Cochran⁵ describe curvilinear regression as a technique for fitting data to a curve or curve fitting. This is in effect, what is being done in this analysis.

The curvilinear regression equation can be expressed as a curve drawn on a scattergram or as a polynomial equation

$$(Y = c + b_1X + b_2X^2).$$

The problem is to determine the constants b_1 , b_2 and c in the polynomial. The Curvilinear Regression Equations to make these determinations are:

$$b_1 = \frac{(\sum x_1 y) (\sum x_2) - (\sum x_1 x_2) (\sum x_2 y)}{(\sum x_1^2) (\sum x_2^2) - (\sum x_1 x_2)^2}$$

$$b_2 = \frac{(\sum x_1^2) (\sum x_2 y) - (\sum x_1 x_2) (\sum x_1 y)}{(\sum x_1^2) (\sum x_2^2) - (\sum x_1 x_2)^2}$$

$$c = \frac{\sum Y - b_1 \sum X_1 - b_2 \sum X_2}{N}$$

The variables in the equations above are derived as follows:

$$1. \sum x_1^2 = \sum X_1^2 - \frac{(\sum X_1)^2}{N}$$

$$2. \sum x_2^2 = \sum X_2^2 - \frac{(\sum X_2)^2}{N}$$

$$3. \Sigma x_1 x_2 = \Sigma x_1 x_2 - \frac{(\Sigma x_1)(\Sigma x_2)}{N}$$

$$4. \Sigma x_1 y = \Sigma x_1 y - \frac{(\Sigma x_1)(\Sigma y)}{N}$$

$$5. \Sigma x_2 y = \Sigma x_2 y - \frac{(\Sigma x_2)(\Sigma y)}{N}$$

Where:

1. Σx_1^2 is the number projected for each occupation squared then summed for all occupations,
2. $(\Sigma x_1)^2$ is the sum of all numbers projected by the matrix which is then squared,
3. Σx_2^2 is the number projected for each occupation squared then summed for all occupations,
4. $(\Sigma x_2)^2$ is the sum of all numbers projected by the matrix squared, then summed for all occupations,
5. $\Sigma x_1 x_2$ is the number projected by the matrix times the number projected squared,
6. Σx_1 is the sum of all numbers projected by the matrix,
7. Σx_2 is the sum of all numbers projected squared,
8. $\Sigma x_1 y$ is the number projected for each occupation times the number of error for each occupation then summed for all occupations,
9. Σy is the sum of all error in the matrix projections, and
10. $\Sigma x_2 y$ is the number projected for each occupation squared times the number of error for each occupation then summed for all occupations.

ANALYSIS PROCEDURE

The analysis procedures used to retain or reject the hypotheses examined in this study are described below.

Classification Analysis

On September 8, 1972, members of the survey team analyzed all data that had been collected during the survey period. At this time, the results were organized into total employment by occupation. In addition, standardization

of the classification of occupations was checked. The analysis indicated that it was extremely difficult to discriminate between Assemblers A, Assemblers B and Other Assemblers during the survey phase of the project. Because of this difficulty, these occupations have been grouped for statistical analysis purposes. In addition since workers in the printing trades often performed a multitude of different jobs, printing occupations were grouped. The matrix had been modified since the Downing study so that machine and machine tool operators were grouped under the Machinists, etc. category.

Hypothesis 1

Hypothesis 1 which states "The actual error found in occupational profile projections generated by the modified matrix technique will be similar to the error predicted by Downing's equation." will be tested using actual error and predicted error in the Harvey County data.

Actual error will be calculated by determining the difference between actual employment and projected employment for each occupation or occupational cluster. Predicted error will be determined by inserting actual employment for the "X" value in the Downing equation.

A linear regression equation will be determined using actual error in the profile projections as the "Y" value and estimated error (from Downing's equation) as the "X" value.

The test will be an examination of how well this equation fits the $Y = X$ equation.

Hypothesis 2

Hypothesis 2 which states "A scale table which will indicate the accuracy of the modified matrix profile projection on the basis of percent urban population of the forecast area can be developed." will be tested by analyzing the Harvey County data to see if a curvilinear regression equation that describes the relationship between size of error and size of projection can be developed with an acceptable (above .05) correlation which can be fitted to the data.

If such an equation can be determined, then the hypothesis will be retained, but if not, the hypothesis will be rejected.

Development of a Scale Table

If Hypothesis 2 is retained, a scale table of estimated error in profile projections relative to percent of urban population in the forecast area and size of projection will be developed.

The table entries will be calculated by prorating the error on a basis of percent urban and percent rural population. The Downing equation will be used to calculate error for small rural-oriented profile estimates. The equation developed in this study will be used to calculate error for larger urban-oriented profile estimates.

FOOTNOTES

¹Jimmie Lee Downing, op. cit., p. 25.

²Jimmie Lee Downing, op. cit.

³Robert E. Scott, "Occupational Survey," (Puttsburg, Kansas: Kansas State College of Pittsburg, 1967), (Mimeographed).

⁴John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences, (New York: Holt, Rinehart and Winston, Inc., 1969).

⁵William G. Cochran and George W. Snedecor, Statistical Methods (Iowa: The Iowa State University Press, 1967).

Chapter 9

ANALYSIS

INTRODUCTION

This chapter presents the statistical analysis and the disposition of the hypotheses examined in this investigation and a description of additional findings.

DISPOSITION OF HYPOTHESIS 1

Hypothesis 1 which states "The actual error found in occupational profile projections generated by the modified matrix technique will be similar to the error predicted by the Downing equation" was retained.

The linear regression equation obtained using actual error found in profile projections in Harvey County as the X entries and estimated error in the profile projections derived from the Downing equation as the Y entries was

$$Y = 1.015X + 5.590$$

with $R = .89$. A list of the values used to calculate the linear regression equation of actual error versus estimated error can be found in Table 8.

If the Downing equation was completely accurate in predicting error, the linear regression equation would have been $Y = X$ with $R = 1.00$. The slope of the calculated line is 1.015 while the slope of the perfect fit line is 1.000. The calculated line runs approximately 5.590 Y units above the perfect fit line which means that the Downing equation tends to overestimate error in profile projections for urban labor markets, however, this error is marginal when projections are of a significant size.

For a graphic representation of the comparison of the perfect fit line and the computed linear regression line, see Figure 4.

Table 8

Linear Regression Analysis Data

OCCUPATION	X ACTUAL ERROR	Y ESTIMATED ERROR	XY ACTUAL ERROR TIMES ESTIMATED	X ² ACTUAL ERROR	Y ² ESTIMATED ERROR
Aero Engineer	2	1.51	3.02	4	2.28
Chemical Engineer	2	1.87	3.74	4	3.50
Civil Engineer	3	9.14	27.42	9	83.54
Electrical Engineer	10	5.52	55.20	100	30.47
Industrial Engineer	16	8.42	134.72	256	70.90
Mechanical Engineer	21	12.00	252.00	441	144.00
Metal Engineer	4	1.14	4.56	16	1.30
Mining Engineer	0	.77	0	0	.59
Other Engineer	21	8.78	184.38	441	77.09
Chemist	3	4.43	13.29	9	19.62
Ag. Scientist	2	1.51	3.02	4	2.28
Biological Scientist	1	1.14	1.14	1	1.30
Geologist and Related	1	1.14	1.14	1	1.30
Mathematician	0	.77	0	0	.59
Physicist	0	.77	0	0	.59
Other Natural Scientist	1	1.14	1.14	1	1.30
Draftsman	7	11.28	78.96	49	127.24
Surveyor	2	2.61	5.22	4	6.81
Air Traffic Controller	1	.77	.77	1	.59
Radio Operator	6	1.87	11.22	36	3.50
Technicians, Other	6	13.42	80.52	36	180.10
Dentist	76	15.89	413.14	676	252.49
Dietitian	4	4.43	17.72	16	19.62
Professional Nurse	28	80.08	2242.24	784	6412.81
Optometrist	4	3.34	13.36	16	11.16
Osteopath	4	2.24	8.96	16	5.02
Pharmacist	2	4.80	9.60	4	23.04
Physicians & Surgeons	27	21.48	579.96	729	461.39
Psychologist	0	2.61	0	0	6.81

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Table 8 (continued)

OCCUPATION	X	ACTUAL ERROR	Y	ESTIMATED ERROR	XY	ACTUAL ERROR TIMES ESTIMATED ERROR	ACTUAL ERROR SQUARED	ESTIMATED ERROR SQUARED	Y ²
Technician, Medical & Dental	46		29.00		1334.00		2116		841.00
Other Med., Health, N.E.C.	6		16.60		99.60		36		275.56
Teachers	42		198.02		8316.84		1764		39211.92
Economists	1		1.14		1.14		1		1.30
Statisticians	2		1.51		3.02		4		2.28
Other Social Scientists	3		.72		2.31		9		.59
Accountants	30		19.05		571.50		900		362.90
Airplane Pilots	9		4.07		36.63		81		16.56
Architects	0		.77		0		0		.59
Workers, Arts & Entertainment	5		20.09		100.45		25		403.61
Clergymen	16		13.77		220.32		256		189.61
Designers (except Draftsmen)	0		2.61		0		0		6.81
Editors & Reporters	13		2.97		38.61		169		8.82
Lawyers	2		7.33		14.66		4		53.73
Librarians	8		10.21		81.68		64		104.24
Personnel Workers	0		2.61		0		0		6.81
Photographers	2		3.34		6.68		4		11.16
Social & Welfare Workers	1		5.16		5.16		1		26.63
Professional, Other	35		39.28		1374.80		1225		1542.92
Conductors	17		12.71		216.07		289		161.54
Creditmen	6		4.07		24.42		36		16.56
Postmasters & Assistants	4		4.07		16.28		16		16.56
Purchasing Agents	16		6.25		100.00		256		39.06
Managers, N.E.C.	114		174.83		19930.62		12996		30365.53
Secretaries and Related	79		106.59		8420.61		6241		11361.43
Office Machine Operators	37		18.34		678.58		1369		336.36
Accountant Clerks	4		20.09		80.36		16		403.61
Bookkeepers	45		40.25		1811.25		2025		1620.06
Bank Tellers	37		7.33		271.21		1369		53.73
Cashiers	15		41.87		628.05		225		173.10
Mail Carriers	5		11.28		56.40		25		127.24
Postal Clerks	4		9.85		39.40		16		97.02
Shipping & Receiving Clerks	3		10.57		31.71		9		111.72
Telephone Operators	4		17.28		69.12		16		298.60

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Table 8 (continued)

OCCUPATION	X	Y	XY	ACTUAL ERROR X ²	ESTIMATED ERROR Y ²	ACTUAL ERROR X ²	ESTIMATED ERROR SQUARED Y ²
Clerical & Kindred	104	158.22	16454.88	10816	25033.57	10816	25033.57
Salesworkers	220	171.25	37675.00	48400	29326.56	48400	29326.56
Carpenters	14	43.80	613.20	196	1918.44	196	1918.44
Brickmasons	10	58.90	589.00	100	34.69	100	34.69
Cement & Concrete Finishers	4	2.61	10.44	16	6.81	16	6.81
Electricians	24	19.74	473.76	576	389.67	576	389.67
Evacuating, Grading Mach. Op.	14	12.00	168.00	196	144.00	196	144.00
Painters and Paperhangers	3	16.60	49.80	9	275.56	9	275.56
Plasterers	2	1.51	3.02	4	2.28	4	2.28
Plumbers and Pipefitters	24	17.65	423.60	576	311.52	576	311.52
Roofers and Slaters	5	3.70	18.50	25	13.69	25	13.69
Structural Steel Workers	6	7.33	43.98	36	53.73	36	53.73
Foremen, N.E.C.	92	84.95	7815.40	8464	7216.50	8464	7216.50
Machinist	51	88.78	4527.78	2601	7881.89	2601	7881.89
Blacksmith	1	4.07	4.01	1	16.56	1	16.56
Boilermakers	8	3.70	29.60	64	13.69	64	13.69
Heat Treaters	2	1.51	3.02	4	2.28	4	2.28
Millwrights	4	3.34	13.36	16	11.16	16	11.16
Molders, Metal	0	4.43	0	0	19.62	0	19.62
Patternmakers	10	4.43	44.30	100	19.62	100	19.62
Rollers and Roll Hands	0	.77	0	0	.59	0	.59
Sheet Metal Workers	28	27.16	760.48	784	737.67	784	737.67
Tool and Die Makers	1	10.93	10.93	1	119.47	1	119.47
Printing	0	15.89	0	0	252.49	0	252.49
Linemen and Servicemen	26	3.70	96.20	676	13.69	676	13.69
Locomotive Engineers	17	12.71	216.07	289	161.54	289	161.54
Locomotive Firemen	4	2.61	10.44	16	6.81	16	6.81
Airplane Mechanics	3	3.70	11.10	9	13.69	9	13.69
Motor Vehicle Mechanics	9	38.30	344.70	81	1466.89	81	1466.89
Office Machine Mechanics	7	3.34	23.38	49	11.16	49	11.16
Radio and TV Mechanics	2	6.25	12.50	4	39.06	4	39.06
RR and Carshop Mechanics	5	12.93	54.65	25	167.18	25	167.18
Other Mechanics	41	55.70	2283.70	1681	3102.49	1681	3102.49

Table 8 (continued)

OCCUPATION	ACTUAL ERROR X	ESTIMATED ERROR Y	ACTUAL ERROR TIMES ESTIMATED XY	ACTUAL ERROR SQUARED X ²	ESTIMATED ERROR SQUARED Y ²
Bakers	1	5.89	5.89	1	34.69
Cabinetmakers	17	4.43	75.31	289	19.62
Cranemen, etc.	12	7.33	87.96	144	53.73
Glaziers	0	2.24	0	0	5.02
Jewelers	0	2.24	0	0	5.02
Loom Fixers	0	.77	0	0	.59
Lens Grinders and Opticians	1	.77	0	1	.59
Inspectors, Log and Lumber	2	1.51	3.02	4	2.28
Inspectors, Other	33	13.42	442.86	1089	180.10
Upholsterers	3	3.70	11.10	9	13.69
Craftsmen and Kindred, N.E.C.	51	30.01	1530.51	2601	900.60
Drivers, Bus, Truck, & Tractor	11	76.20	838.20	121	5806.44
Deliverymen, Routemen	17	23.53	400.01	289	553.66
Brake and Switchmen	8	23.53	188.24	64	553.66
Power Station Operators	0	.77	0	0	.59
Heaters, Metal	1	.77	.77	1	.59
Welders and Flamecutters	74	65.01	4810.74	5476	4226.30
Assemblers and Operators, N.E.C.	29	168.42	4884.18	841	28365.23
Inspectors, Metal Class B	0	9.14	0	0	83.54
Electroplaters	2	1.51	3.02	4	2.28
Electroplater Helpers	3	1.87	5.61	9	3.50
Knitters and Loomers	0	.77	0	0	.59
Spinners, Textile	0	.77	0	0	.59
Weavers, Textile	0	.77	0	0	.59
Sewers and Stitchers	2	14.04	28.08	4	197.12
Asbestos, Insulation Workers	0	.77	0	0	.59
Attendants, Auto Service	39	37.19	1450.41	1521	1383.10
Plasters, Powermen	0	1.14	0	0	.59
Laundry and Dry Cleaning Op.	35	18.70	654.50	1225	349.69
Meat Cutters, (exc. Meat Packing)	2	10.93	21.86	4	119.47
Mine Op, Laborers, N.E.C.	1	.77	.77	1	.59
Firemen	0	8.78	0	0	77.09
Guards, Watchmen, Doorkeepers	8	5.89	47.12	64	34.69
Policemen	0	13.42	0	0	180.10

Table 8 (continued)

OCCUPATION	X ACTUAL ERROR	Y ESTIMATED ERROR	XY ACTUAL ERROR TIMES ESTIMATED ERROR	X ² ACTUAL ERROR SQUARED	Y ² ESTIMATED ERROR SQUARED
Bartenders	11	6.25	68.75	121	39.06
Cooks	23	69.38	1595.74	529	4813.58
Counter & Fountain Workers	2	15.89	31.78	4	252.49
Waiters & Waitresses	24	87.71	2105.04	576	7693.04
Airline Stewards	2	1.51	3.02	4	2.28
Attendants, Hospital and Other Institutions	46	92.03	4233.38	2116	8469.52
Charwomen and Cleaners	30	14.04	421.20	900	197.12
Janitors and Sextons	8	52.32	418.56	64	2737.38
Practical Nurses	70	37.99	2659.30	4900	1443.24
Other Service Workers	72	65.17	4692.24	5184	4247.13
Laborers, exc. Farm & Mine	14	123.88	1734.32	196	15346.25

$$\Sigma X = 2210$$

$$\Sigma Y = 3032.08$$

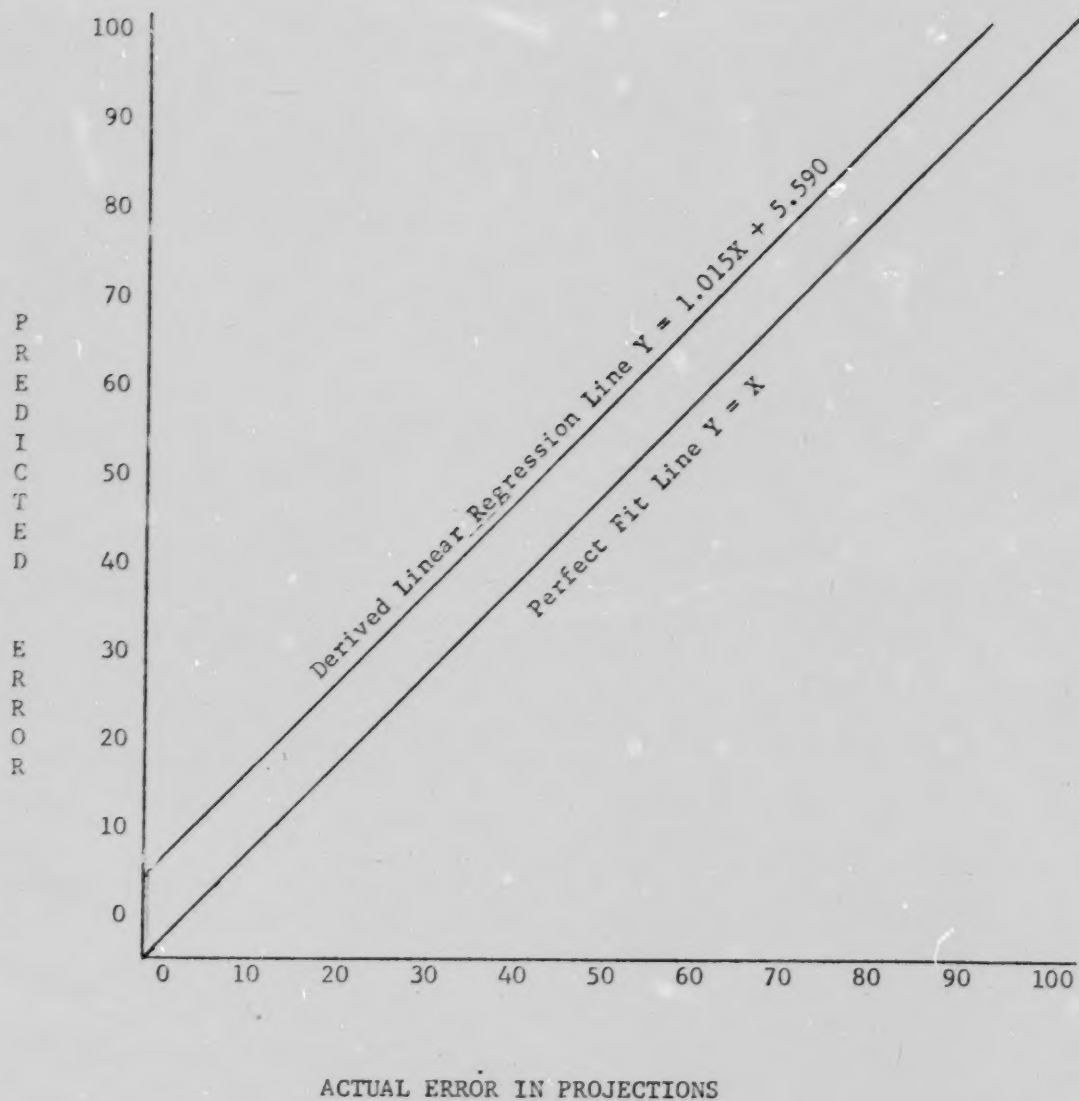
$$\Sigma XY = 154969.32$$

$$\Sigma X^2 = 140485$$

$$\Sigma Y^2 = 261759.46$$

FIGURE 4

A GRAPHIC COMPARISON OF THE RELATIONSHIP
THE EQUATIONS $Y = 1.015X + 5.590$ AND $Y = X$



DISPOSITION OF HYPOTHESIS 2

Hypothesis 2 which states "A scale table which will indicate the accuracy of the modified matrix profile projections on the basis of percent urban population of the forecasted area and the size of projections can be developed" was retained.

The first step in developing a scale of error table was to develop an equation similar to the Downing equation from the Harvey County data (Note: As indicated previously, Harvey County has an urban economy). Using actual error in the profile projections found by survey as the Y entries and the size of the profile projections from the modified matrix technique as the X entries, curvilinear regression yielded an equation which associated size of error with size of profile projection. This equation was $Y = 1.660 + .277X - .00019X^2$ with $R = .81$ where Y is the estimated error and X is the size of projection. Figure 5 is a graphic representation of this equation in comparison with the Downing equation. A list of the values used to calculate the equation can be found in Table 9.

The second step used to develop the scale of error table was to calculate the size of error for given projections for urban areas (using $Y = 1.660 + .277X - .00019X^2$) and the size of error for given projections for rural areas (using the Downing equation $Y = .7721 + .368X - .00019X^2$).

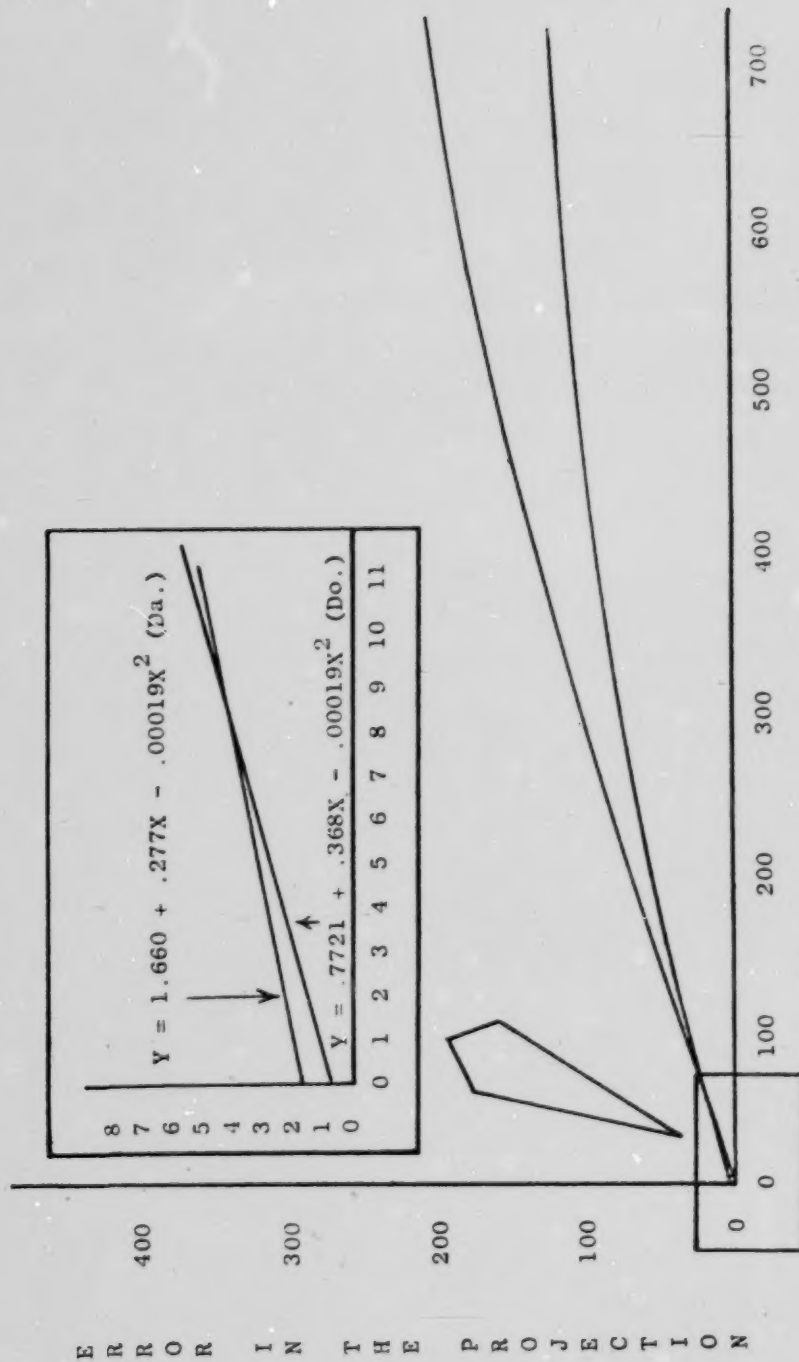
The third step used to develop the scale of error table was to prorate the error developed in step two depending on the percent of urban and rural population. For example, if urban projections of 600 workers had 20 percent error and rural projections of 600 workers had 10 percent error, then an area which was fifty percent urban and fifty percent rural would have 15 percent error in 600 worker projections. Table 10 is the scale of error table relative to size of projection and percent urban population in the forecast area.

ADDITIONAL FINDINGS

Downing indicates that in Wabaunsee and Edwards counties, salesworkers and managers were overestimated. This was also true in Harvey County. Due to modifications in the projection technique which were based on the Downing

FIGURE 5

A GRAPHIC COMPARISON OF THE DOWNING EQUATION AND
THE EQUATION DEVELOPED IN THIS STUDY
(THE DANIELS EQUATION)



Curvilinear Regression Analysis Data

OCCUPATION	ERROR IN MATRIX PROTECTION Y	NUMBER PROJECTED BY MATRIX X ₁	NUMBER PRO- JECTED BY MATRIX SQUARED Y ₂	ERROR IN MATRIX PRO- JECTION SQUARED X ₂	NUMBER PRO- JECTED BY MATRIX SQUARED X ₁	NUMBER PRO- JECTED BY MATRIX SQUARED X ₂	NUMBER PRO- JECTED TIMES X ₁	NUMBER PRO- JECTED SQUARED TIMES NUMBER ERROR X ₂	NUMBER PRO- JECTED TIMES X ₁ ²	NUMBER PRO- JECTED SQUARED TIMES NUMBER ERROR X ₂ ²
Engineer, Aero	2	2	4	4	4	16	4	8	8	8
Engineer, Chemical	2	3	9	4	9	81	6	18	27	27
Engineer, Civil	3	23	529	9	529	279841	69	1587	12167	12167
Engineer, Electrical	10	13	169	100	169	28361	130	1690	2197	2197
Engineer, Industrial	16	441	441	256	441	194481	336	7056	9261	9261
Engineer, Mechanical	21	31	961	441	961	923521	651	2081	29791	29791
Engineer, Metal	4	1	1	16	1	1	4	4	1	1
Engineer, Mining	0	0	0	0	0	0	0	0	0	0
Engineer, Other	21	22	484	441	484	234256	462	10164	10648	10648
Chemist	3	10	100	9	100	10000	30	300	1000000	1000000
Aq. Scientist	2	2	4	4	4	16	4	8	8	8
Biological Scientist	2	1	1	1	1	1	1	1	1	1
Geologist	1	1	1	1	1	1	1	1	1	1
Mathematician	0	0	0	0	0	0	0	0	0	0
Physicist	0	0	0	0	0	0	0	0	0	0
Other Natural Scientist	1	1	1	1	1	1	1	1	1	1
Draftsman	7	29	841	49	841	707281	203	5887	24389	24389
Surveyor	2	5	25	4	25	625	10	50	125	125
Air Traffic Controller	1	0	0	1	0	0	0	0	0	0
Radio Operator	6	2	4	36	4	16	12	24	8	8
Technicians, Other	6	35	1225	36	1225	1500625	210	7350	42875	42875
Dentist	26	42	1764	676	1764	3111696	1092	45864	74088	74088
Dietitian	4	10	100	16	100	10000	40	400	1000	1000
Professional Nurse	28	247	61009	784	61009	3722098081	6916	1708252	15069223	15069223
Otometrict	4	7	49	16	49	2401	28	196	343	343
Osteopath	4	4	16	16	16	256	16	64	64	64
Pharmacist	2	11	121	4	121	14641	22	242	1331	1331
Physicians and Surgeons	27	58	3364	729	3364	3316496	1566	90828	195112	195112
Psychologists	0	5	25	0	25	625	0	0	125	125

Table 9 (continued)

OCCUPATION	ERROR IN MATRIX	Y	NUMBER PROJECTED BY MATRIX	x_1	NUMBER PRO- JECTED BY MATRIX	x_2	SQUARED MATRIX	ERROR IN SECTION	y^2	NUMBER PRO- JECTED BY MATRIX	x_1^2	SQUARED MATRIX	NUMBER PRO- JECTED BY MATRIX	x_2^2	$x_1 y$	NUMBER PRO- JECTED SQUARED TIMES NUMBER ERROR	$x_2 y$	NUMBER PRO- JECTED SQUARED TIMES NUMBER ERROR	$x_1 y_2$
Technicians, Med. and Dental	46		80	6400	2116	6400		40960000	3680	294400	512000		40960000	3680	294400	512000		40960000	3680
Other Medical, Health N.E.C.	6		44	1936	36	1936		3748096	264	11616	85184		3748096	264	11616	85184		3748096	264
Teachers	42		536	287296	1764	287296		82538991616	22512	12066932	153990656		82538991616	22512	12066932	153990656		82538991616	22512
Economists	1		1	1	1	1		1	1	1	1		1	1	1	1		1	1
Statisticians	2		2	4	4	4		16	4	8	8		16	4	8	8		16	4
Other Social Scientists	3		0	0	9	0		0	0	0	0		0	0	0	0		0	0
Accountants	30		51	2601	900	2601		6765201	1530	78030	132651		6765201	1530	78030	132651		6765201	1530
Airplane Pilots	9		9	81	81	81		6561	81	729	729		6561	81	729	729		6561	81
Architects	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0
Workers in Arts, Entertainment	5		54	2916	25	2916		8503056	270	14580	157464		8503056	270	14580	157464		8503056	270
Clergymen	16		36	1296	256	1296		1679516	576	20736	46656		1679516	576	20736	46656		1679516	576
Designers (except Draftsmen)	0		5	25	0	25		625	0	0	125		625	0	0	125		625	0
Editors and Reporters	13		6	36	169	36		1296	78	468	216		1296	78	468	216		1296	78
Lawyers	2		18	324	4	324		104976	36	648	5832		104976	36	648	5832		104976	36
Librarians	8		26	676	64	676		456976	208	5408	17576		456976	208	5408	17576		456976	208
Personnel Workers	0		5	25	0	25		625	0	0	125		625	0	0	125		625	0
Photographers	2		7	49	4	49		2401	14	98	343		2401	14	98	343		2401	14
Social and Welfare Workers	1		12	144	1	144		20736	12	144	1728		20736	12	144	1728		20736	12
Professional Other	35		111	12321	1225	12321		151807041	3885	431235	1367631		151807041	3885	431235	1367631		151807041	3885
Conductors (RR)	17		33	1089	289	1089		1185921	561	18513	35937		1185921	561	18513	35937		1185921	561
Creditmen	6		9	81	36	81		6561	54	486	729		6561	54	486	729		6561	54
Postmasters and Assistants	4		9	81	16	81		6561	36	324	729		6561	36	324	729		6561	36
Purchasing Agents	16		15	225	256	225		50625	240	3600	3375		50625	240	3600	3375		50625	240
Managers, N.E.C.	114		821	674041	12996	674041		454131269681	93594	76840674	553387661		454131269681	93594	76840674	553387661		454131269681	93594
Secretaries & Related	79		345	119025	6241	119025		14166950625	27255	9402975	41063625		14166950625	27255	9402975	41063625		14166950625	27255
Office Machine Operators	37		49	2401	1369	2401		5764801	1813	88837	117649		5764801	1813	88837	117649		5764801	1813
Accountant Clerks	4		54	2916	16	2916		8503056	216	11664	157464		8503056	216	11664	157464		8503056	216
Bookkeepers	45		114	12996	2025	12996		168896016	5130	584820	1481544		168896016	5130	584820	1481544		168896016	5130
Bank Tellers	37		18	324	1364	324		104976	666	11988	5832		104976	666	11988	5832		104976	666
Cashiers	15		119	14161	225	14161		200333921	1785	212415	1685159		200333921	1785	212415	1685159		200333921	1785
Mail Carriers	5		29	841	25	841		707281	145	4205	24386		707281	145	4205	24386		707281	145
Postal Clerks	4		25	625	16	625		390625	100	2500	15625		390625	100	2500	15625		390625	100
Shipping & Receiving Clerks	3		27	729	9	729		531441	81	2187	19683		531441	81	2187	19683		531441	81
Telephone Operators	4		46	2116	16	2116		4477456	184	8464	97336		4477456	184	8464	97336		4477456	184

Table 9 (Continued)

OCCUPATION	Y ERROR IN MATRIX PROJECTION	X NUMBER PROJECTED BY MATRIX	X ₁	X ₂	SQUARED MATRIX NUMBER PRO- JECTED BY	ERROR IN MATRIX PRO- JECTION	Y ²	X ² NUMBER PRO- JECTED BY MATRIX	SQUARED MATRIX NUMBER PRO- JECTED BY	X ₁ ²	X ₂ ²	X ₁ Y NUMBER PRO- JECTED TIMES ERROR	X ₂ Y NUMBER PRO- JECTED TIMES ERROR	X ₁ Y ² NUMBER PRO- JECTED TIMES ERROR	X ₂ Y ² NUMBER PRO- JECTED TIMES ERROR
Clerical and Kindred N.E.C.	104	638	407044	10816	407044	165684817936	66352	42332576	259694072	66352	42332576	42332576	129423580	451217663	259694072
Salesworkers	220	767	588289	48400	588289	346083947521	168740	129423580	451217663	168740	129423580	129423580	218750	1953125	451217663
Carpenters	14	125	15625	196	15625	244140625	1750	218750	1953125	1750	218750	218750	1953125	1953125	1953125
Brickmasons	10	14	196	100	196	38416	140	1960	2744	140	1960	1960	1960	2744	2744
Cement & Concrete Finishers	4	5	25	16	25	625	20	100	125	20	100	100	100	125	125
Electricians	24	53	2809	576	2809	7890481	1272	67416	148877	1272	67416	67416	67416	148877	148877
Excavating, Grading Mach. Op.	14	31	961	196	961	923521	434	13454	29791	434	13454	13454	13454	29791	29791
Painters & Paperhangers	3	44	1236	9	1936	3748096	132	5808	85184	132	5808	5808	5808	85184	85184
Plasterers	2	2	4	4	4	16	4	8	8	4	8	8	8	8	8
Plumbers & Pipefitters	24	47	2209	576	2209	4879681	1128	53016	103824	1128	53016	53016	53016	103824	103824
Roofers & Slaters	5	8	64	25	64	4096	40	320	512	40	320	320	320	512	512
Structural Metal Workers	6	18	324	36	324	104976	108	1944	5832	108	1944	1944	1944	5832	5832
Foremen, N.E.C.	92	265	70225	8464	70225	4931550625	24380	6460700	18609625	24380	6460700	6460700	6460700	18609625	18609625
Machinist & Related	41	263	69169	1681	69169	4784350561	10783	2835929	18191447	10783	2835929	2835929	2835929	18191447	18191447
Blacksmith	1	9	81	1	81	6561	9	81	729	9	81	81	81	729	729
Boilermakers	8	8	64	64	64	4096	64	512	512	64	512	512	512	512	512
Heat Treaters	2	2	4	4	4	16	4	8	8	4	8	8	8	8	8
Millwrights	4	7	49	16	49	2401	28	196	343	28	196	196	196	343	343
Molders, Metal	0	10	100	0	100	10000	0	1000	1000	0	1000	1000	1000	1000	1000
Patternmakers	10	10	100	100	100	10000	100	1000	1000	100	1000	1000	1000	1000	1000
Rollers & Roll Hands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sheetmetal Workers	28	78	6084	784	6084	37015056	2184	170352	474552	2184	170352	170352	170352	474552	474552
Tool & Die Makers	1	28	784	1	784	614656	28	784	21952	28	784	784	784	21952	21952
Printers	0	42	1764	0	1764	3111696	0	0	74088	0	0	0	0	74088	74088
Linemen & Servicemen	26	8	64	676	64	4096	208	1664	512	208	1664	1664	1664	512	512
Locomotive Engineers	17	33	1089	289	1089	1187109	561	3713	35973	561	3713	3713	3713	35973	35973
Locomotive Firemen	4	5	25	16	25	625	20	100	125	20	100	100	100	125	125
Airplane Mechanics	3	8	64	9	64	4096	24	192	512	24	192	192	192	512	512
Motor Vehicle Mechanics	9	108	11664	81	11664	13604896	972	104976	1296712	972	104976	104976	104976	1296712	1296712
Office Machine Mechanics	7	7	49	49	49	2401	49	343	343	49	343	343	343	343	343
Radio & TV Mechanics	2	15	225	4	225	50625	30	450	3375	30	450	450	450	3375	3375
Railroad & Carshop Mech.	5	28	784	25	784	614654	140	3920	21952	140	3920	3920	3920	21952	21952
Other Mechanics	41	163	26896	1684	26896	723394816	6683	1102736	4384048	6683	1102736	1102736	1102736	4384048	4384048

Table 9(continued)

OCCUPATION	Y	ERROR IN MATRIX PRO-	Y ₂	NUMBER PRO- JECTED BY MATRIX SQUARED	ERROR IN MATRIX PRO-	Y ₂	NUMBER PRO- JECTED BY MATRIX SQUARED	X ₁	NUMBER PRO- JECTED BY MATRIX SQUARED	X ₂	NUMBER PRO- JECTED BY MATRIX SQUARED	X ₁ Y	NUMBER PRO- JECTED BY MATRIX SQUARED	X ₂ Y	NUMBER PRO- JECTED BY MATRIX SQUARED	X ₁ Y ₂
Bakers	1							14	196	1	38416	14	196	196	2744	
Cabinetmakers	17							10	100	289	10000	170	1700	1000	1000	
Cranemen	12							18	144	144	104976	216	3888	5832	5832	
Glaziers	0							4	16	0	256	0	0	0	64	
Jewelers	0							4	16	0	256	0	0	0	64	
Loom Fixers	0							0	0	0	0	0	0	0	0	
Lens Grinders, Opticians	1							0	0	0	0	0	0	0	0	
Inspectors, Log & Lumber	2							2	4	1	16	4	8	8	8	
Inspectors, Other	33							35	1225	1089	1498875	1155	40425	42825	42825	
Upholsterers	3							8	64	9	4096	32	192	512	512	
Craftsmen & Kindred N.E.C.	51							83	6889	2601	47458321	4233	351339	571797	571797	
Drivers, Bus, Truck, Tract.	11							233	54289	121	2947295521	2563	597179	12649337	12649337	
Deliverymen, Routemen	17							64	4096	289	16777216	1088	69632	262144	262144	
Brakemen & Switchmen	8							64	4096	64	16777216	512	32768	262144	262144	
Power Station Operators	0							0	0	0	0	0	0	0	0	
Heaters, Metal	1							0	0	1	0	0	0	0	0	
Welders & Flamecutters	74							194	37636	5476	1416468496	14356	2785064	7301384	7301384	
Assemblers & Operatives NEC	29							1204	1449616	841	1449616	34916	42038864	1745337664	1745337664	
Inspectors, Metal Class B	0							23	529	0	279841	0	0	0	12167	
Electroplaters	2							2	4	4	16	4	8	8	27	
Electroplater Helpers	3							3	9	9	81	9	27	27	27	
Knitters & Loomers	0							0	0	0	0	0	0	0	0	
Spinners, Textile	0							0	0	0	0	0	0	0	0	
Weavers, Textile	0							0	0	0	0	0	0	0	0	
Sewers, Stitchers	2							37	1369	0	1874161	74	2738	51652	51652	
Asbestos Insulation Wkrs	0							0	0	0	0	0	0	0	0	
Attendants, Auto Service	39							105	11025	1521	121550625	4095	429975	1157625	1157625	
Blasters, Powermen	0							1	1	0	1	0	0	0	1	
Laundry & Drycleaning Op.	35							50	2500	1225	6250000	1750	87500	125000	125000	
Meat Cutters, except Meat Packers	2							28	784	4	614656	56	1586	21952	21952	
Mine Op, Laborers N.E.C.	1							0	0	1	0	0	0	0	0	
Firemen	0							22	484	0	234256	0	0	0	10648	
Guards, Watchmen, Doorkeepers	8							14	196	64	38416	112	1568	2216	2216	
Policemen	0							35	1225	0	1500625	0	0	0	42875	

Table 9 (continued)

OCCUPATION	Y ERROR IN MATRIX PROJECTION	NUMBER PROJECTED BY MATRIX	x_1	x_2	NUMBER PRO- JECTED BY MATRIX SQUARED	ERROR IN MATRIX PRO- JECTION SQUARED	y^2	NUMBER PRO- JECTED BY MATRIX SQUARED	x_1^2	NUMBER PRO- JECTED BY MATRIX SQUARED	x_2^2	NUMBER PRO- JECTED TIMES NUMBER ERROR	$x_1 y$	NUMBER PRO- JECTED SQUARED TIMES NUMBER ERROR	$x_2 y$	NUMBER PRO- JECTED TIMES NUMBER PRO- JECTED SQUARED	$x_1 y^2$
Bartenders	11	15	225	121	225	121	225	50625	165	2475	3375	9129329	1004663	3532	1536216	16194277	8
Cooks	23	209	43681	529	43681	529	43681	1908029761	4807	1004663	9129329	74088	1536216	8	2475	3375	8
Counter, Fountain Wkrs.	2	42	1764	4	1764	4	1764	3111696	84	3532	74088	16194277	1536216	8	2475	3375	8
Waiters, Waitresses	24	253	64009	576	64009	576	64009	4097152081	6072	1536216	16194277	16194277	1536216	8	2475	3375	8
Airline Stewardesses	2	2	4	4	4	4	4	16	4	16	16	16	16	4	16	16	4
Attendants, Hospital & Other Institutions	46	292	85264	2116	85264	2116	85264	7269949696	13432	3922144	24897088	24897088	3922144	8	2475	3375	8
Charwomen & Cleaners	30	37	1369	900	1369	900	1369	1874161	1110	41070	50653	50653	41070	8	2475	3375	8
Janitors, Sextons	8	152	23104	64	23104	64	23104	533794816	1216	184832	3511808	3511808	184832	8	2475	3375	8
Practical Nurses	70	105	11025	4900	11025	4900	11025	121550625	7350	2765952	7529536	7529536	2765952	8	2475	3375	8
Other Service Workers	72	196	38416	5184	38416	5184	38416	1475789056	14112	2765952	7529536	7529536	2765952	8	2475	3375	8
Laborers, except Farm & Mine	14	430	184900	196	184900	196	184900	34188010000	6020	2588600	79507000	79507000	2588600	8	2475	3375	8

$$\sum Y = 2210 \quad \sum X_1 = 10190 \quad \sum X_2 = 4457532 \quad \sum Y^2 = 139485 \quad \sum X_2^2 = 4457534 \quad \sum X_1 X_2 = 3229223005806 \quad \sum X_1 Y = 591585$$

$$\sum X_2 Y = 339100528 \quad \sum X_1 X_2 = 3437165984$$

Table 10

Error Analysis for Error Relative to
Percent Urban Population

Size of Profile Projection (Workers)	Associated Needs Projection (Annually)	Percent Error from Downing's Study (51 percent urban)	Percent Error from Daniels' Study (57 percent urban)	Percent Error in Areas Which Are:				
				40 Percent Urban or Less	45 Percent Urban	50 Percent Urban	55 Percent Urban	60 Percent Urban or More
50	2	37.38	30.07	46.73	41.53	36.33	31.13	25.93
100	4	35.67	27.46	46.22	40.36	34.50	28.65	22.79
150	6	34.46	25.96	45.39	39.32	33.25	27.18	21.11
200	8	33.38	24.73	44.46	38.32	32.14	25.97	19.80
250	10	32.35	23.62	43.51	37.31	31.11	24.91	18.71
300	12	31.35	22.55	42.60	36.35	30.10	23.85	17.30
350	14	30.36	21.52	41.70	35.40	29.10	22.80	16.50
400	16	29.39	20.52	40.73	34.43	28.13	21.83	15.53
450	18	28.42	19.51	39.85	33.50	27.15	20.80	14.45
500	20	27.45	18.53	38.88	32.50	26.18	19.83	13.48
550	22	26.48	17.55	37.91	31.56	25.21	18.86	12.51
600	24	25.50	16.57	36.93	30.58	24.23	17.88	11.53
650	26	24.56	15.61	35.99	29.64	23.29	16.94	10.59
700	28	23.61	14.63	35.13	28.73	22.33	15.93	9.53
750	30	22.65	13.67	34.17	27.77	21.37	14.97	8.57
800	32	21.69	12.71	33.21	26.81	20.41	14.01	7.61
850	34	20.74	11.74	32.26	25.86	19.46	13.06	6.66
900	36	19.74	10.78	31.36	24.96	18.56	12.16	5.76
950+	36+	19.74	10.78	31.36	24.96	18.56	12.16	5.76

study, the problems he found in "machinist," "machine tool operators," "auto service attendants" and "workers in arts and entertainment" clusters were not found in Harvey County data.

During the survey-many managers who were also skilled workers; i.e., cosmetologists, repairmen, salesmen, etc; were identified. These people, more often than not, preferred to be classified as skilled workers rather than management. This contributed to a low figure relative to managers.

In addition, it appears that the modified matrix technique is better suited to urban areas than it is to rural areas since the error projection line for urban areas falls below the error projection line for rural areas.

Again, error was found when the matrix was projecting related occupations (this time in the printing trades), however, it cannot be determined whether the error was in the survey techniques or in the projection techniques. The problem was overcome by grouping printing trades under a single category.

A new source of error not found in the Downing study was the situation where the employing organization was located outside the county but workers were based in the county. This was corrected as far as railroad workers were concerned. It is possible that the error in projecting managers and salesworkers is also related to this type of problem.

SUMMARY

Hypothesis 1 was retained. The Downing equation projected error in the profiles similar to that found in the survey. It should be noted, however, that the Downing equation error projections differed slightly from actual errors in that they were consistently higher.

Hypothesis 2 was also retained. A table was developed which estimated error relative to size of projection and percent urban population in the forecast area. The percent of urban population in the forecast area seems to have a profound effect on the percent error in projections.

Chapter 10

CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

This chapter presents conclusions based on the findings presented in Chapter 9 and recommendations based on the conclusions.

CONCLUSIONS

1. The projections produced by the modified matrix approach are accurate enough for planning vocational and technical education programs.

2. Based upon the finding, the Modified Matrix is a relatively superior technique for determining manpower needs projections in terms of cost, timeliness and accuracy.

3. The percent of error in the projections decrease as the size of the profile projection increases.

4. The percent of error in the projection decreases as the urban/rural population ratio increases.

5. The matrix has difficulty discriminating between closely related occupations and therefore grouping of occupations will increase the accuracy of projections. For example, a grouping of the printing occupations produces more accurate projections than projections for each of the printing trades.

6. The small labor market effect identified in the Downing study is less identifiable in Harvey County.

7. Workers in managerial occupations often prefer to be identified as skilled workers, i.e., cosmetologists, repairmen, etc.

8. A weakness of the interview technique is the inability to prorate workers on the basis of a multitude of job functions. In addition, classification is often a subjective decision on the part of the interviewee.

9. Miscoding of source data was not identifiable in Harvey County. (Note: Downing found miscoding to be a major factor in Wabaunsee County).

10. Workers employed in surrounding counties who actually worked in Harvey County posed a problem in developing occupational profiles.

RECOMMENDATIONS

1. The Kansas State Department of Education, Division of Vocational Education, should use the Modified Matrix Technique data for (1) developing Table of the State Plan for Vocational Education, (2) input into decisions about initiating new programs and retaining existing programs and, (3) input into the state funding formula. (Conclusion 1 and 2)

2. The State Department of Education, Division of Vocational Education should place planning emphasis on state wide total manpower needs projections first and regional (county groups) manpower needs projections second. County manpower needs projections should be considered to a lesser extent. (Conclusion 3 and 9) This would indicate that the State Department of Education, Division of Vocational Education, should move toward regional program planning and funding.

3. Rural areas should place less emphasis on the regional manpower needs data than should urban areas. (Conclusion 4 and 6)

4. Programs should evolve into cluster based programs first, and into specific occupational areas second. (Conclusion 5)

SUMMARY

The Modified Matrix Technique is a satisfactory tool for projecting manpower needs data to be used in the vocational education planning process. Accuracy of projections improve when the forecast area is large (regional) and urban, and when occupational clusters are used.

It is recommended that the Kansas State Department of Education, Division of Vocational Education utilize this technique and data generated thereof for input into the planning and funding of vocational and technical education programs. In addition, it is recommended that a regional/statewide planning approach be developed. This implies that regions within the state be designated as planning regions. Finally, it is recommended that the program cluster concept be explored since accuracy of data improves when occupations are clustered.

Part 3

THE USE OF MANPOWER NEEDS AND STUDENT
INTEREST TO PLAN VOCATIONAL AND
TECHNICAL PROGRAMS IN KANSAS

Robert Gregg Price

Chapter 11

THE PROBLEM

INTRODUCTION

The Vocational Education Amendments of 1968 require that vocational and technical education programs prepare students for job vacancies that either presently exist or will exist in the near future. The law also states that student interest should be considered when planning vocational offerings.¹

Using student interest and manpower needs as criteria for planning vocational and technical education, may lead to difficulties if the two factors are not compatible. If student interest and manpower needs are compatible, then neither criteria need be relegated to a secondary position, since high student interest in a program will generally occur when manpower need for the type of worker produced by the program is high. On the other hand, if the criteria are not compatible, then one of the criteria most likely will be emphasized over the other.

There is no set policy in Kansas which dictates the mix of student interest and manpower needs necessary for the establishment of a vocational or technical program.² If student interest and manpower needs are compatible, it may not be necessary that a set policy exist. If the two criteria are incompatible, then the establishment of a policy may be desirable.

When the two criteria are not in agreement, one of two situations probably exists, i.e., either manpower needs have been subjugated to student interest or student interest has become subordinate to manpower needs in terms of the planning process. In the case where one of the criteria is subordinate to the other, it is possible that present decision making procedures are satisfactory to the policy maker. When this is not the situation, the policy maker would probably want to make an adjustment in the planning process.

Before the need for a policy which dictates the mix of student interest and manpower needs can be determined, chief state school administrators and other policy makers should understand the relationships between the two

criteria that are presently used to establish programs.

Program enrollment is a direct measure of the program planning process. Consequently, the mix of student interest and manpower needs in the planning process can be examined by investigating the relationships between student interest and manpower needs and program enrollment.

STATEMENT OF THE PROBLEM

This study will attempt to answer a series of questions designed to aid policy makers in determining the need for a set procedure to be used in planning the vocational and technical program mix for Kansas.

The first question to be answered is, "Are student interest and manpower needs compatible criteria on which vocational and technical programs can be established?"

If the answer to the first question is "Yes" then the second question will be, "Are these criteria the basis on which the present program mix has been established?"

If the answer to the first question is "No" then the second question will be, "Which of the two criteria, if either, is dominate in the program planning process?"

HYPOTHESES TO BE TESTED

The following hypotheses will be statistically tested in this study.

Hypothesis 1

There is a significant positive correlation between the rank order of occupational clusters by student interest and the rank order of the occupational clusters by manpower needs.

Hypothesis 2 (Alternative 1)

There is a significant positive correlation between the rank order of occupational clusters by program enrollment and the rank order of the occupational clusters by program enrollment and the rank order of occupational clusters by a combination factor derived from manpower needs and student interest.

Hypothesis 2-A (Alternative 2)

There is a significant positive correlation between the rank order of occupational clusters by program enrollment and the rank order of the occupational clusters by student interest.

Hypothesis 2-B (Alternative 2)

There is a significant positive correlation between the rank order of occupational clusters by program enrollment and the rank order of the occupational clusters by manpower needs.

DELIMITATIONS

This study is subject to the following delimitations or parameters.

1. This study is limited to include only those occupations which are covered in the Kansas Manpower Utilization System for Training (K-MUST) Project, and the Kansas Vocational Information for Education and Work (K-VIEW) system and for which training programs exist in Kansas.
2. Student interest data is limited to data on those students who have referenced the occupations in the K-VIEW system.
3. Manpower needs figures represent only those manpower needs of the state of Kansas.
4. Vocational and technical program enrollments used in this study include only full-time public school enrollments within the state of Kansas.
5. The study is cross-sectional in nature and the data is, therefore, restricted to the 1971-72 school year K-VIEW references which were used to determine student interest, 1971-72 school year vocational program enrollments and 1972-76 Kansas manpower needs data from the 1973 K-MUST report.

ASSUMPTIONS

The study is based on the following assumptions.

1. Student references to the K-VIEW system are assumed to indicate student occupational preference (interest) in much the same manner that Nielsen Surveys represent national preference of television programming.³
2. The job cards available in the K-VIEW system are assumed to include the majority of subprofessional jobs which interest potential Kansas vocational

and technical students.

3. Vocational program enrollment figures obtained from the Kansas State Department of Education are assumed to represent actual enrollments in vocational and technical training programs in Kansas.

4. It is assumed that figures obtained from the 1973 K-MUST Report are a reasonably accurate representation of manpower needs in the state of Kansas.

5. Recorded occupational references to the K-VIEW system are assumed to represent Kansas junior high and high school student interests in subprofessional occupations.

SUMMARY

Manpower needs and student interest are important criteria to consider when planning vocational and technical programs. A policy specifying the mix of manpower needs and student interest necessary for the establishment of vocational and technical programs does not exist in Kansas.

If the two criteria are incompatible, the establishment of a policy concerning the mix may be desirable. Under these circumstances, if one of the criteria does not exhibit dominance in planning, an adjustment in the planning process may be needed.

Program enrollment is identified as a direct measure of past program planning. The relationship between manpower needs, student interest and program enrollment should be examined in an effort to determine the combination of student interest and manpower needs previously used in the program planning process. If a significant positive correlation is found between manpower needs and student interest, an attempt will be made to determine if a significant positive correlation exists between an average of the ranks for manpower needs and student interest and the ranks for program enrollment thus indicating that past planning conformed to the 1968 Amendments.

If no significant positive relationship between these two criteria is revealed, comparisons of each of these criteria will be made with program enrollment to identify whether manpower needs, student interest or some other factors dominate in the planning process. The determination of the desirability of predominance of one of these criteria over the other in program planning

procedure is a socio-political decision. If decision makers should decide that the dominate criterion was unacceptable as the most important consideration of the two criteria when planning vocational and technical programs, the state, most likely, should develop a planning policy.

FOOTNOTES

¹United State Statutes at Large, 90th Cong., 2D Sess., 1968, Vol. 82, Public Law 90-576, (Washington: Government Printing Office, 1968), pp. 1064-1098.

²Statement by R. B. Daniels, Program Administrator of Industrial Education, Division of Vocational Education, personal interview, June 14, 1972.

³See Chapter 2 for further discussion.

Chapter 12

BACKGROUND INFORMATION

INTRODUCTION

This chapter contains a list of definitions designed to help the reader understand terms used in the study. In addition, there is a review of literature concerning student interest and manpower needs.

DEFINITIONS

Agricultural Workers

Workers in these occupations are concerned with growing, harvesting, catching, and gathering land and aquatic plant and animal life and the products thereof; and providing services in support of these activities.¹

Bureau of Labor Statistics (BLS)

This bureau has the main responsibility for developing and testing the adequacy of the matrix system used to project manpower needs. The Bureau of Labor Statistics is part of the Department of Labor.²

Bureau of Labor Statistics Occupation by Industry Matrix (BLS Matrix)

This is a set of employment and expansion ratios for various industries and occupations within industries. One hundred and sixteen industries and one hundred and sixty-two occupational clusters representing the national economy are included in the matrix.³

Clerical Workers

These are workers concerned with making, classifying, and filing records including written communications.⁴

Construction Workers

These workers are in craft and non-craft occupations, not elsewhere classified, concerned with the building and repairing of structures.⁵

Drivers and Deliverymen

These occupational workers are concerned with transporting cargo over highways, city streets, or within compounds of industrial construction or mining areas, by driving vehicles powered by gasoline, diesel, propane, or related fuels, or electricity.⁶

Food Service Workers

This area includes workers concerned with preparing food and beverages and serving them to patrons of such establishments as hotels, clubs and restaurants.⁷

Manpower Needs

These are the gross manpower needs listed in the Handbook for Vocational and Technical Education Planners released by the Division of Vocational Education, Kansas Department of Education and the Department of Adult and Occupational Education, Kansas State University.⁸

Mechanics and Repairmen

Workers in this group are concerned with repairing engines and accessories, power trains, suspension systems, and other mechanical units of automobiles, trucks, tractors, buses, and trackless trolleys; graders, bulldozers, cranes, power shovels, portable air compressors, and other gasoline, diesel-powered engineering equipment; motorized materials, handling equipment and wheeled or tracked military vehicles.⁹

Medical Workers

These workers include those subprofessionals concerned with the health care of humans or animals, or work in occupations in sanitation, environmental and public health, or in laboratories or other health facilities.¹⁰

Metal Craftsmen

Workers in this area, not elsewhere classified, are concerned with

shaping and conditioning metal by rolling, forging, extruding, drawing out, punching, blanking, and press working.¹¹

Printing Craftsmen

This group includes workers concerned with assembling and setting type matter for printing by means of typesetting or composing machines. It includes craftsmen at linotype machines which assemble letters into lines and cast strips of type from type metal; and monotype machines which compose type matter in separate letters.¹²

Protective Service Workers

Workers in this area are concerned with protecting the public against crime, fire, accidents, and acts of war.¹³

Sales Workers

These workers are to be found in occupations concerned with selling commodities when knowledge of the commodities sold is required.¹⁴

Service Workers N.E.C.

These are workers in service occupations that have not been previously classified.

Standard Industrial Classification (SIC)

This is a code assigned to each industry on the basis of its major activity, which is determined by the product or group of products produced or handled, or services rendered. Establishments may be classified on a two, three or four digit basis depending upon the specificity required.¹⁵

Program Enrollment

This is the 1972 full-time public school vocational and technical program enrollment in the state of Kansas.

Student Interest

Student interest is defined in this study as student preference for

various subprofessional occupations and/or training programs. This interest is measured by references to various occupations or training programs in the K-VIEW system with occupations or programs referenced most, considered to be preferred occupations or programs.

Subprofessional Occupations

These are jobs requiring educational preparation at less than the baccalaureate level.

Technicians N.E.C.

These are workers in technical occupations not classified as medical.

Textile Occupations

Workers in these occupations are concerned with shaping, joining, spinning, weaving and otherwise fabricating textiles, textile products, fur and hair.¹⁶

The K-MUST System

This is a project initiated by the Division of Vocational Education in Kansas designed to furnish meaningful information to Kansas vocational and technical education planners for decision-making purposes.

The K-VIEW System

This is an information system designed to provide Kansas students with information concerning occupations, training programs and training institutions in the state. The information is brief, easy to read and includes sources where additional information may be obtained on the occupations being referenced.

Transportation and Public Utilities N.E.C.

This division includes operators concerned with moving people or materials by means of automotive and railway vehicles, aircraft, freshwater of seagoing vessels, pipes, and pumps. Their activities include loading bulk materials into conveyances; ascertaining number of passengers and kind of materials being conveyed; directing course of carrier routing materials;

servicing carriers; and related activities.¹⁷

These are occupations concerned with generation, transmission, and distribution of electricity; generation and distribution of steam for heat and power, including marine propulsion; generation of utility gas, and storage and distribution of natural and manufactured gas for power, illumination, or heating purposes; filtration, purification, and distribution of water for domestic, commercial, or industrial consumption; and collection, treatment, and disposal of sewage and refuse.¹⁸

Vocational and Technical Education

This represents that portion of education responsible for preparing students to work in subprofessional occupations.

Vocational and Technical Education Programs

This is educational training designed to prepare students for specific subprofessional occupations.

Vocational and Technical Students

These are students enrolled in vocational and technical programs.

STUDENT INTEREST

This section describes, (1) standardized instruments and other techniques which have been used to measure vocational interests, (2) studies that have attempted to evaluate vocational interest data that has been generated, (3) studies that have attempted to examine the relationship between vocational interests and manpower needs and (4) a rationale for the approach used to determine student vocational interests in this study.

Standardized instruments that will be discussed in this section include (1) the Strong Vocational Blank, (2) the Minnesota Vocational Interest, and (3) the Kuder Preference Record (Form DD). Non-standardized techniques discussed are centered around the questionnaire approach.

The Strong Vocational Interest Blank (SVIB) is scored by a weighting

agreement with the occupational group. Pluses indicate agreement. Minuses indicate disagreement. The SVIB occupational groups are mainly at the professional and/or college trained level. The possible responses to items are 'like', 'indifferent', and 'dislike'.¹⁹

O'Shea and Harrington indicated that there is a considerable body of evidence indicating predictive validity of the SVIB.²⁰ Campbell feels that interests, as measured by the SVIB are stable over long periods of time.²¹

The Minnesota Vocational Interest Inventory (MVII) was scored in manner similar to the SVIB. Possible responses are 'like' and 'dislike'. The occupational groups are at the technical level.²²

Results of a study of the MVII by Silber and Barnette indicate concurrent and predictive validity for vocational high school boys. This study used twenty-one of the MVII occupational groups for comparison.²³

The Kuder Preference Record (Form DD), also known as the OIS, is scored using a coefficient which reflects similarity between a person's response to all one hundred items in the inventory with the norm group's responses to all one hundred items rather than to only those that distinguish an occupational group from men-in-general. The OIS reports for occupations over the entire occupational spectrum. Possible responses are markings of most and least liked alternatives of a triad of items describing varied activities.²⁴

Zytowski indicated that there is a lack of co-variance between any two or the three above mentioned tests (SVIB, MVII, and OIS) which might be attributed to deficiencies in response format and scoring or to lack of equivalence in the occupational norm groups.²⁵ There are many additional instruments that attempt to measure student vocational or career interests such as the Career Maturity Inventory²⁶ developed by Crites. These other instruments are similar to the three mentioned above.

All of the standardized instruments described to this point have two severe limitations, i.e., they are based on student responses to questionnaires and do not measure any student initiated action which might indicate his occupational preference, and they are limited to either broad clusters of occupations or to a small number of detailed occupations. Kansas vocational educators are becoming disillusioned with these subjective measures and are seeking a broadly based, yet detailed, objective occupational interest assessment system.²⁷

Roe and Siegelman indicate that early environmental factors were not satisfactory predictors of vocational interests. They did find, however, that the interactions between parent and child develop attitudes in the child which may play a significant part in the selection of an occupation. This implies that one way to predict student vocational interests would be to evaluate the attitudes of the communities towards certain occupations.²⁸ Such a community evaluation would most likely pose many problems.

Holland assumed that a person's vocational choice is the product of the interaction of his heredity and a variety of cultural and personal forces including peers, parents and significant adults, his social class, American culture and the physical environment. He has identified a hierarchy of habitual or preferred methods for dealing with environmental tasks such as making a vocational choice. He has defined six major occupational environments.

The motoric environment includes people in occupations such as laborers, machine operators, aviators, truck drivers, and carpenters. The intellectual environment is represented by physicists, anthropologists, chemists, mathematicians and biologists. Social workers, teachers, interviewers, vocational counselors and therapists are designated as the supportive environment. The conforming environment is comprised of bank tellers, secretaries, bookkeepers and file clerks. Salesmen, politicians, managers, promoters, and business executives personify the persuasive environment. The esthetic environment includes musicians, artists, poets, sculptors and writers.²⁹

Viernstein translated the Holland classifications into the Dictionary of Occupational Titles classifications. The fact that this translation is possible and can be done well illustrates the strong relationship between Holland's occupational environments and specific occupations.³⁰

Williams concludes that students select vocations which agree with their values and personality. He found that life values, work values and personality characteristics could be feasibly separated into Holland's six environments.³¹ However, this theory has not been developed to the point that specific occupational preferences can be predicted.

Several studies have used the questionnaire approach as a method for defining student interest. Thirty-eight thousand Indiana High School graduates completed a twenty-two item questionnaire specifying curriculum and occupational choices related to their educational and vocational plans. The characteristics

and geographical distribution of this sample group compared favorably to the total high school senior population in the state. Approximately forty-three percent were vocationally oriented in terms of their high school studies. Student interest in vocational education increased in the senior year with preferences for business and service.³²

One thousand, one hundred and forty-six seniors for the year 1965, 416 graduates of the 1960 and 1962 class, 1,034 fifth grade parents and 250 business firms identified the vocational and technical educational needs in the Shiawassee-Clinton area of Michigan by responding to questionnaires. Data analysis showed that present vocational offerings were not adequate in terms of student interest. Occupational education was needed in the high schools and post-secondary institutions and programs were needed in variety of occupational areas.³³

A survey was conducted by the Master Planning Committee for occupational education of the Garden City Community College, Garden City, Kansas. One hundred and six graduates of the 1967 and 1969 classes completed and returned questionnaires. Survey results indicated that high school programs pursued in order of popularity were college preparation, general business and agriculture.³⁴

In an effort to find significant relationships between interests and manpower needs, a four county study of youth and adult interests in community college occupational programs was conducted in Michigan. Student interests and employer needs for auto mechanics, secretaries, and salespeople correlated. Employer needs and student interest did not correlate in other occupations indicated.³⁵

Although the survey approach has many advantages and is used extensively, it has at least two major disadvantages, i.e., the student must answer as to preference even if he has no preference among the possible alternatives, and the Hawthorne Effect could cause students to select the more prestigious occupations.

This study used a new student vocational interest measurement technique. Student references to job descriptions in the K-VIEW system are clustered by similar occupations. The clusters with the greatest number of references are considered to contain occupations most preferred by the students. Broad inferences are made about large bodies of students which should contribute to

making this a suitable method for determining student interest in this study.

The technique can be classified as unobstrusive in that while the student completes the reference card each time he uses the K-VIEW deck, there is no pressure to make any given response. Instructors or other school personnel are usually not present. The student's name does not appear on the card. The student has no idea as to how the data will be used. Webb states that when using such unobstrusive measures for obtaining information, there is little possibility these measures will influence behavioral changes or require role-playing which would refute the data acquired.³⁶

A similar data collection technique which is well-known is the method Nielsen uses to determine television program preference. Nielsen has developed an indirect measure of interest whereby observation of actions or the results of actions of individuals is not necessary. Measurement of those who subscribe to a newspaper or magazine in terms of their sex, income, and household purchases represents another indirect measurement.³⁷

Gallup Robinson Inc. conducts interviews with magazine readers to determine what ads they recall with the magazine closed. Since the readers are not monitored when expressing interest in a particular ad, this represents an indirect measure of interest.³⁸ These techniques like the K-VIEW reference technique are unobstrusive in that indirect measurement of a sample member action is achieved.

The K-VIEW technique is also similar to the survey method because it allows the student to choose from a group of occupations. An advantage over the survey technique is that in the K-VIEW technique action is usually student initiated. Students who are completely undecided or unconcerned do not use the system.

Cooley indicated that preferences for broad categories of occupational classifications should be more predictable than narrow classifications.³⁹ In a report of Project TALENT Cooley states:

We have been citing recent researchers to illustrate the strong tendency of vocational psychologists today to focus inquiry on differences among a few large groups or families of occupations, rather than on specific occupations. This tendency is partly a recognition of the reality that specific occupations do not work well as research criteria. There are far too many of them and there far too much overlapping among them in any measurement space. Successful empiricism requires discriminably taxonomies.⁴⁰

Using the K-VIEW technique, occupations can be grouped into broad job clusters

or death with as specific jobs since the occupations are identified by census categories.

One limitation of the technique is that data can be obtained only from those students in schools where K-VIEW services are offered. On the other hand, K-VIEW schools cover approximately fifty-seven percent of all Kansas high school and junior high school enrollment. There is no indication that student attitudes in schools not having the K-VIEW system. There have been more than one thousand references made to the occupations listed in the K-VIEW system to date.

In conclusion, information obtained from the K-VIEW system represents an attempt to acquire unsolicited occupational student interest data. Its specificity presents the opportunity to relate data obtained to vocational and technical program enrollment and net manpower needs in Kansas. As the K-VIEW system matures and more schools use it, K-VIEW procedures will be expanded and improved both cross-sectionally and longitudinally making student interest data obtained from the system more meaningful for future studies.

MANPOWER NEEDS

This section includes (1) background information concerning national efforts to identify manpower needs, (2) a description of some of the methods used to determine manpower needs and their application and (3) a brief history of the development of a net subprofessional manpower needs system for Kansas. During the last decade despite an otherwise prosperous economy, the nation has experienced a somewhat high unemployment rate. A substantial proportion of this unemployment has been attributed to structural unemployment. Structural unemployment may occur where:

1. The unemployed may not possess the necessary skills.
2. Older workers may need retraining or upgrading skills.
3. Young workers may require training before getting a job.

Nonwhite workers between the ages of sixteen and nineteen present an especially perplexing problem in that their 1968 unemployment rate was the same as the overall unemployment rate during the 1930's depression. In addition, the 6.8 percent unemployment rate of the urban unskilled laborer is comparable to the rates reached by these workers during postwar recessions.⁴¹

The structural nature of unemployment indicates that vocational

education. Recent legislative acts concerned with this issue are:

1. The Area Redevelopment Act of 1961,⁴²
2. The Manpower Development and Training Act of 1962,⁴³
3. The Vocational Education Act of 1963,⁴⁴
4. The Higher Education Facilities Act of 1963,⁴⁵
5. The Economic Opportunity Act of 1964,⁴⁶
6. The Civil Rights Act of 1964,⁴⁷
7. The Higher Education Act of 1965,⁴⁸
8. The Appalachian Act of 1965,⁴⁹ and
9. The Vocational Education Amendments of 1968.⁵⁰

Vocational educators should provide training "realistic in the light of actual or anticipated opportunities for gainful employment"⁵¹ according to the 1968 Amendments of the 1963 Vocational Education Act. It is the responsibility of the state employment security commission to make available to the state board and local education agencies occupational information on reasonable prospects of employment in the community and elsewhere.⁵² Medvin felt that in many instances, state employment services are unable to meet this responsibility because of the costly survey techniques that are used.⁵³

In an effort to assist state employment security commissions attempting to provide adequate manpower needs data inexpensively, the Department of Labor has financially encouraged research to investigate alternative methods for projecting manpower needs. Some of these methods are:

1. The Experimental Employer Needs Survey Technique,
2. The Industry Expert Approach,
3. The Leading Indicators Approach,
4. The Unfilled Job Opening-Occupational Outlook Handbook Approach, and
5. The BLS Occupation by Industry Approach.⁵⁴

The Experimental Employer Needs Survey Technique uses information obtained from employers to project manpower needs. Phone calls, letters or personal interviews may be used for acquiring information. This method promotes contact between school representatives and employers. It can be used as a basis for getting additional information. Occupational examination can be extensive if funds are available for this purpose.

The Employer Survey Technique is relatively expensive. The stratified random samples approach to larger labor markets requires explicit identification

of all firms in the labor market being surveyed. Reliability of answers given by employers is questionable. Survey procedures must be repeated if data updating is required. Bias may be introduced by uncooperative firms. The survey method can be time consuming.⁵⁵

The Occupational Training Information System (OTIS) developed in Oklahoma represents an application of the Experimental Employer Needs Survey Technique. Surveyed employers report their manpower needs to personnel from the vocational education system. The unemployed and individuals learning skills on the job are estimated from the records of the State Employment Security Office. Projected supply and projected demand data are matched to determine differences which are used in planning the state vocational programs. An Advisory Committee which includes education officials, employer representatives and the OTIS staff, monitor the system and recommend needed changes.⁵⁶

The Industry Expert Approach represents an appropriate method to use where a limited industrial activity employs all or a large part of the workers in the occupations to be studied. Local Chambers of Commerce, manufacturing executives, employment services and vocational educators may be contacted to assist in selecting a list of local industrial experts to be questioned. Specific questions should be designed to obtain opinions on present and future industrial trends and anticipated training needs.⁵⁷

The Industry Expert Approach is not effective in obtaining information on broad inter-industry oriented occupations. However, it does provide accurate, comprehensive occupational information for vocations restricted to a particular activity. Interviewers should know how to analyze occupations, understand the local industrial community being considered and be familiar with the industry being studied. The costs of interviewing can be minimized if the industrial representatives are carefully selected.⁵⁸

The conference, an alternative to the individual interview, allows the moderator to obtain the opinion of several industrial representatives simultaneously. If conducted properly, it has the added advantage of allowing group discussion of the opinions presented at the conference.

Roney and Braden in a study of occupational education beyond high school in Oklahoma obtained the opinions of experts from fifty Oklahoma organizations on their future need for technicians. The major activities included in the study were manufacturing, public utilities, service, government agencies, and

petroleum, service and public utilities. The organizational representatives indicated that two-year post-high school demand greatly exceeded the supply even if all Oklahoma graduate technicians stayed in Oklahoma.⁵⁹

In the Leading Indicators Approach, successful industries are analyzed to determine their present and future employment by occupation. This information is used as a basis for planning vocational education. It is assumed that (1) successful industries can be identified, (2) data obtained can be used to show the change in occupational structure over time and (3) occupational structure is related to productivity.

An experiment conducted by Fischer in Project VISION involved efforts to determine indicators which would bring about a change in the occupational mix of an area. Change in capacity or product line and the possibility of relocation were considered as likely occurrences that would result in the readjustment of an area's occupational mix. Returned questionnaires revealed that capacity was difficult to define and product lines remained relatively constant. Data was not acquired from new firms due to their inability to complete the questionnaire adequately. Researchers felt that intramarket firm mobility had little effect on the occupational mix.⁶⁰

The Unfilled Job Openings-Occupational Outlook Handbook Technique utilizes available data such as unfilled job openings from employment service agency records. Forecasts of national trends for specific occupations obtained from The Occupational Outlook Handbook may be used in this technique.⁶¹

This method of computing manpower needs is systematic and straightforward. The data is separated by occupation, but judgment by informed officials is necessary when making forecasts. The accuracy of forecasts using the Unfilled Job Opening-Occupational Outlook Handbook Technique has not been checked. This is due partly to the way in which the data is presented. Medvin feels that the data should reveal trends and directions as well as pinpointing occupations with continuous shortages.⁶²

Because of its relatively low cost and the adequately explicit occupational picture of a specified work force it presents, the BLS Occupation by Industry Approach (BLS Matrix Approach) is considered the most promising of the alternative methods. The BLS Matrix is a set of tables indicating employment trends for occupations based on Standard Industrial Classifications. The methods used attempt to identify an area's occupational profile and project

manpower needs for these occupations.⁶³

Two important limitations of the approach are that national trends are applied to local (state) situations and projections cannot be provided for small labor markets.⁶⁴ Despite its low cost, state employment security commissions are experiencing difficulty when attempting to fund the BLS Matrix Approach.

The discussion of alternatives to projecting manpower needs presented above indicates that each of the techniques has advantages and disadvantages. What appears to be needed is a combination and modification of techniques that will maximize advantages and minimize disadvantages.

In 1971, a contract to develop a system for projecting Kansas' manpower needs was made by the Division of Vocational Education of the Department of Education with Kansas State University. The system was to be used in planning vocational education in Kansas.⁶⁵

Annual cycling of the system was to be financially feasible. Where possible, small labor market manpower needs were to be determined using localized trend data. It was decided that a modified version of the BLS Matrix Approach would come closest to meeting these requirements.

The Modification of the BLS Matrix Approach is designed to include localized trends and possible projections for small labor markets with the assistance of the State Employment Security Commission, the Regional Office of the Bureau of Labor Statistics and the Regional Manpower Administration Office.

The Modified Matrix Technique is based on the following assumptions:

1. Local industrial occupational structures are similar to national industrial occupational patterns.
2. Using the Kansas Employment Security Commission's state occupational profile as a means for adjusting the local profile improves the estimates.
3. Reasonable estimates can be made of how local labor markets will expand using national expansion figures.
4. Local expansion rate estimates can be improved by making adjustments for past labor market trends.
5. Local replacement factors can be reasonably estimated using national replacement factors.
6. Error resulting from the use of national base factors and ratios

can be partially reduced by using the present year industrial structure.

Manpower needs were projected in accordance with the following procedures.

1. The Standard Industrial Classification (SIC) structure of the local community was determined.

2. An estimate of the occupational profile in the local community was made.

3. The local occupational profile was adjusted in terms of the state occupational profile provided by the Kansas Employment Security Commission.

4. Occupation by industry rates were used to compute the expected employment expansion for the projection period.

5. Local labor market trends were applied to the projected expansion figures.

6. The need for occupational replacements was determined.

7. Manpower needs for the projection period was defined as the sum of replacement needs and expansion needs.

Upon initial examination of the output utilizing the Modified Matrix Approach, error in developing occupational profiles for small labor markets does not seem to be a restricting factor. Efforts will be made to investigate and identify areas where projections are weak and additional modifications might improve the final output.⁶⁶

SUMMARY

The Strong Vocational Interest Blank, the Minnesota Vocational Interest Inventory, the Kuder Preference Record (Form DD) and other standardized instruments seem to have two severe limitations relative to predicting student preference for various types of vocational training, i.e., they are based on student initiated action which might indicate his occupational preference, and they are limited to either broad clusters of occupations or to a small number of detailed occupations.

The popular and frequently used survey approach also has two limitations, i.e., the student must answer as to preference even if he has no preference among the possible alternatives, and the Hawthorne Effect could cause students to select the more prestigious occupations.

The K-VIEW system (selected to determine student interest in this study) uses unobstrusive data gathering techniques to collect information on student preferences in a wide variety of occupations. This technique was selected as there is little possibility that the measure will contribute to behavioral changes or require role-playing which could refute the data acquired. It is also preferred by Kansas vocational education administrators as it is an objective unsolicited student action measure.

The Experimental Employer Needs Survey Technique, the Industry Expert Approach, the Leading Indicators Approach, the Unfilled Job Openings-Occupational Outlook Handbook Approach, and the BLS Occupation by Industry Approach were each deemed to have limitations which caused them to be unsatisfactory for projecting manpower needs in Kansas. A modification of the BLS Occupation by Industry Approach was developed to project manpower needs. Data used in this study was generated by this paproach.

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⁶¹Fischer, op. cit., p. 13.

⁶²Medvin, op. cit., p. 74.

⁶³Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Vol. 1, Developing Area Manpower Projections, (Washington: Government Printing Office, 1969), pp. 7-10.

⁶⁴Ibid., p. 5.

⁶⁵Statement by James L. Harris, K-MUST Project Director, personal interview, March 13, 1972.

⁶⁶Ibid.

Chapter 13

PROCEDURES

INTRODUCTION

This chapter presents the populations, samples, data collection techniques, data tabulation techniques, statistical tools and analysis techniques used to evaluate the hypotheses presented in Chapter 11.

THE POPULATIONS

There are five populations used to evaluate the hypotheses in this study. The first is the population of sub-professional occupations in Kansas, the second is the population of vocational and technical training programs, the third population is students enrolled in Kansas Vocational and Technical programs, the fourth is the population of potential vocational and technical students in Kansas and the fifth is the population of future job vacancies in Kansas.

THE SAMPLES

The five samples used to conduct this study are representative of the five populations. The sample of occupations from the population of sub-professional occupations in Kansas which is examined in this study is that group of occupations specified by the Kansas Employment Security Commission and the Division of Vocational Education, Kansas State Department of Education and covered in both the K-VIEW and K-MUST systems. The sample of training programs includes all training programs in Kansas as identified by the State Department of Education.

Annual enrollment in Kansas public school vocational and technical programs represents all vocational and technical students in Kansas. The Division of Vocational Education, Kansas State Department of Education has

provided data on this sample.

The population of potential vocational and technical students is represented by a sample of potential students who referenced the K-VIEW system. One thousand, one hundred and nineteen references to discrete occupations were tabulated.

Data on the population of future job vacancies in Kansas has been obtained from the records of the K-MUST project and the Kansas Employment Security Commission. This data represents the sample used here.

THE DATA COLLECTION TECHNIQUES

The techniques used to collect information for this study will be designed to obtain the necessary data as accurately and efficiently as possible. The Division of Vocational Education, State Department of Education will provide data on the 1972 enrollment in vocational-technical programs in the state of Kansas. The K-MUST report released in January, 1973, will represent the source for Kansas manpower needs. Student interest data on potential vocational-technical students will be acquired from the K-VIEW Evaluation Form which was completed by the student using the K-VIEW facilities.

THE DATA TABULATION TECHNIQUES

Data obtained for the research project will be tabulated using several techniques depending upon the type of data and the manner in which it is available for use. Kansas sub-professional manpower demand data has been accumulated from authoritative sources by the K-MUST project. The manpower needs (demand) data is listed in the 1973 K-MUST report. Using the Kansas Employment Security Commission's occupational breakdown as a guide, the demand data as identified in the K-MUST report will be clustered by occupational category. These occupational clusters will be used to represent the manpower needs data for this study.

Records obtained from the Kansas State Department of Education represented 1972 enrollments in vocational-technical programs and were separated by type of educational institution and vocational-technical program. The enrollment information will be accumulated by vocational-technical program and

grouped in accordance with the same procedure used to identify manpower needs for the study.

Student interest data was specified as being student referenced occupations listed on the completed K-VIEW evaluation forms. These forms will be tabulated by occupation as designated in the United States Census. Occupational totals will then be clustered following the same format used in specifying manpower needs and vocational-technical program enrollments.

After grouping manpower needs, vocational-technical program enrollment and student interest data by occupational clusters, these clusters will be ranked in each of the three areas from the occupational cluster with the greatest number of personnel indicated to the occupational cluster with the least number of personnel indicated. Tied numbers will be given equal rankings each representing an average of the consecutive rank placements which would have been filled by the tied numbers.¹

STATISTICAL TOOLS

The Spearman Rank Correlation Coefficient has been chosen as an appropriate statistical tool to use to determine relationships between manpower needs and student interest and vocational-technical program enrollment. The Spearman Rank Correlation Coefficient is a non-parametric statistic requiring neither normality of distribution nor homogeneity of variance.² Ranks rather than numerical values are used in computing the statistic. Approximations improve with larger samples.³ Distribution of the numerical values used in this study is heterogeneous making the appearance of tied values unlikely. The Spearman Rank represents a good approximation of the Pearson formula.

To determine the Spearman Rank Correlation Coefficient, two of the three areas, manpower needs, student interest or program enrollment will be chosen to compute the statistic. The ranks of the two areas will be matched for each of the occupational clusters. The difference between the ranks of the two areas for each occupational cluster will be determined and squared. The squared remainders for the occupational clusters will be summed and multiplied by six. The product will be divided by the number of occupational clusters cubed minus the number of occupational clusters. The quotient will be subtracted from one. The remainder will represent the Spearman Rank

Correlation Coefficient.

The formula for the Spearman Rank Correlation Coefficient appears as follows:

$$R = 1 - \frac{6\sum d^2}{N^3 - N}$$

where:

R = Spearman Rank Correlation Coefficient

$\sum d^2$ = Sum of the squared differences between the ranks for the two areas being compared

N = Total number of occupational clusters.⁴

The computed Spearman Coefficient may range from a plus one indicating a perfect positive relationship where high rankings of one area correlate with high rankings of the other area, to a negative one indicating a perfect negative relationship where high rankings of one area correlate with low rankings of the other area.⁵

A correlation between .20 and .35 shows a very slight relationship between the variables. Correlations ranging from .35 to .65 are statistically significant beyond the one percent level. Crude group predictions may be achieved around .50. Accurate group predictions are possible for correlations at .65 or better. Correlations over .85 indicate close relationships and are rarely found in educational studies. Plus values are positive relationships, minus values, negative relationships.⁶

THE ANALYSIS PROCEDURES

Techniques to be used in the effort designed to aid policy makers in determining the need for a set procedure in planning the vocational and technical program mix for Kansas involve computing Spearman Rank Correlation Coefficients between manpower needs and student interest and vocational-technical program enrollment and analyzing the coefficients for significant positive correlations. The procedure followed in computing the Spearman Coefficients for any two of the three areas to be compared has been designed to answer successive questions cited in the statement of the problem.

If a significant positive correlation is found between student interest and manpower needs, these areas will be considered compatible criteria on

which to establish vocational-technical programs. In order to determine if manpower needs and student interest are the basis on which the present program mix is established, an average of the rankings of these two areas will be compared to vocational-technical program enrollment. If a significant positive correlation is found, manpower needs and student interests will be considered criteria on which the present program mix is established.

If significant positive correlation is not found between manpower needs and student enrollment, then an attempt will be made to determine if either area was used as a basis for establishing vocational-technical program enrollment using the Spearman formula. If a significant positive correlation is found to exist, then student interest will be considered the dominate criterion.

If, however, there is no significant positive correlation, then occupational cluster rankings for manpower needs will be compared to vocational-technical program enrollment. If a significant positive correlation is identified, manpower needs will be considered the dominate criterion in the program planning process. If no significant positive correlation is found in the comparison process, then neither student interest nor manpower needs will be ascertained as significant criteria upon which vocational-technical programs are established in Kansas.

SUMMARY

Five Kansas populations (1) sub-professional occupations, (2) vocational and technical training programs, (3) vocational and technical students, (4) potential vocational and technical students, and (5) future job vacancies are identified. A representative sample from each of the five populations will be obtained for the study. The source of each sample is specified as follows:

1. Sub-professional occupations - Kansas Employment Security Commission and the Division of Vocational Education, Kansas State Department of Education.
2. Vocational and technical training programs - Division of Vocational Education, Kansas State Department of Education.
3. Vocational and technical program enrollment - Division of Vocational Education, Kansas State Department of Education.

4. Occupations in which potential vocational and technical students are interested - K-VIEW system.

5. Future job vacancies - Kansas Manpower Utilization System for Training.

Sample data will be collected on sub-professional occupations, vocational and technical training programs, vocational and technical program enrollment and future job vacancies using the information obtained from the sources listed above. The occupations in which potential vocational and technical students are interested will be acquired by collecting the referenced occupations recorded on the evaluation forms completed by the users of the K-VIEW system.

The techniques employed to tabulate data involve grouping the data into occupational clusters. Vocational and technical program enrollment, occupations in which potential vocational and technical students are interested and future job vacancies will be arranged to correspond to these occupational clusters. Amounts accumulated for each occupational cluster will be ranked from the occupational cluster with greatest amount to the occupational cluster with the least amount for student interest, manpower needs and program enrollment.

The statistical tool chosen to detect significant relationships between manpower needs and student interest and program enrollment is the Spearman Rank Correlation Coefficient. Ranks for two of the three areas indicated will be chosen to compute the statistic. The areas will be selected according to set procedure.

Using the Spearman formula, an attempt will be made to determine if manpower needs and student interest are compatible. A significant positive correlation will reveal compatibility. The next step will be to match an average of the ranks of student interest and manpower needs to program enrollment to see if a combination of these two items is used to plan vocational and technical pro-rams in Kansas. A significant positive correlation will imply that both are used in the planning process.

Where there is no significant positive correlation between manpower needs and student interest, each category will be matched with program enrollment using the Spearman Rank Coefficient formula to determine the dominance, if any, of student interest or manpower needs in planning vocational and technical programs. 161

FOOTNOTES

¹Robert K. Young and Donald J. Veldman, Introductory Statistics for the Behavioral Sciences, (New York: Holt, Rinehart and Winston, Inc., 1965), p. 371.

²John I. Griffin, Statistical Methods and Applications, (New York: Holt, Rinehart and Winston, Inc., 1962), p. 270.

³John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences, (New York: Holt, Rinehart and Winston, Inc., 1969), p. 84.

⁴*Ibid.*, p. 82.

⁵*Ibid.*, p. 72.

⁶Walter E. Borg, Education Research an Introduction, (New York: David McKay Company, Inc., 1963), p. 282-283.

Chapter 14

ANALYSIS

INTRODUCTION

This chapter is concerned with analyzing the data obtained by methods outlined in Chapter 13. The first step presented is the technique used to cluster or interface the data, the second step is ranking the data and the third step is testing the hypotheses.

Hypotheses 1 will be tested to determine if manpower needs and student interest are compatible criteria for planning vocational and technical education. (Note: Compatible criteria are criteria that have a significant positive correlation). If the criteria are compatible, Hypothesis 2 (Alternative 1) will be tested. If the criteria are not compatible Hypotheses 2, A and B, (Alternative 2) will be tested. An analysis will be made of base data in an attempt to determine why hypotheses were either retained or rejected.

CLUSTERING THE DATA

The first step in clustering the data was to identify (1) all training programs offered by public education in Kansas, (2) all occupations utilized by the K-MUST System and (3) all occupations included in the K-VIEW deck. The second step was to define broad clusters under which programs, occupations and K-VIEW cards could be grouped. Census occupational groupings were used to define these clusters. Occupations were easily classified under this clustering scheme. Training programs were classified under specific clusters indicated by Vocational Education and Occupations¹ which interfaces occupations and training programs. K-VIEW reference cards carry a Dictionary of Occupational Titles designation and were classified similar to the techniques used to classify occupations. Table 11 depicts the interfacing scheme developed.

Table 11

Interfacing Strategy

Manpower Needs	Student Interest	Program Enrollment
Farmers and Farm Workers Groundskeepers Nursery Workers Agricultural Mechanics Agricultural Sales Workers Agricultural Service Workers Agricultural Products Workers Conservation Workers	Agricultural Workers Groundskeepers Nursery Workers Dairy Farm Hands Agriculture Technologists Farm Workers	Production Agriculture Agriculture Supervision and Service Agricultural Products Agricultural Mechanics Horticulture Agricultural Resources Forestry
Stenos, Typists, Secretaries Office Machine Operators Keypunch Operators Computer Programmers Computer Operators Shipping and Receiving Clerks	Clerical Workers Secretaries File Clerks Duplicating Machine Operators Clerk Typists Cashiers Stock Clerks Telephone Operators	Accounting and Computing Business Data Processing Filing, Office Machine Information Communication Material Support Personnel Management Typing and Related

Table 11 (Continued)

Manpower Needs	Student Interest	Program Enrollment
	Clerical Workers (Continued)	
Telephone Operators	Receptionists	Steno, Secretary and Related
Accounting Clerks	Library Helpers	
Hand Bookkeepers		
Bank Tellers		
Cashiers		
Other Clerical and Kindred		
Personnel Clerks		
Managers and Supervisors		
	Construction Workers	
Carpenters	Electrician Apprentices	Carpentry
Electricians	Electrician Helpers	Electricity
Brick Masons	Painter Apprentices	Masonry
Tile Setters	Carpenter Apprentices	Other Construction
Excavating and Grading Machine	Bricklayer Apprentices	Maintenance
Operators	Bricklayer Helpers	Plumbing and Pipefitting
Cabinet Makers	Plumber Apprentices	
Plumbers	Floor Cover Installers	
Painters	Painter Helpers	
	Plasterer Apprentices	
	Plasterer Helpers	
	Cement Masons	
	Carpenter Helpers	
	Tile Setter Apprentices	
	Pipefitter Apprentices	
	Glazier Helpers	
	Roofer Helpers	
	Hod Carriers	

Table 11 (Continued)

Manpower Needs	Student Interest	Program Enrollment
Drivers	Drivers and Deliverymen Tractor-Trailer Drivers Deliverymen Bus Drivers Taxicab Drivers	Transportation Truck Driving
Cooks Waiters/Waitresses Fountain Workers Bartenders	Food Service Workers Bus Boys Counter Girls Waiters Bakers Helpers Quantity Food Preparers and Supervisors	Quantity Food Occupations
Dental Assistants Medical Assistants Medical Lab Technicians Licensed Practical Nurses Registered Nurses Medical Secretaries Medical Record Clerks Ward Clerks Dental Hygienists Nurse Aides	Medical Workers Dental Assistants Nurses Aides Medical Orderlies Medical Lab Technologists Medical Research Technicians Medical Technologists Pre-Cytechnologists Certified Lab Assistants Medical Records Librarians Practical Nurses	Dental Assistant Dental Hygiene Medical Lab Assistant Associate Degree Nurse Practical Nurse Nurse Aide Medical Records Medical Assistant Pharmacology

Table 11 (Continued)

Manpower Needs	Student Interest	Program Enrollment
	Medical Workers (Continued)	
	Pharmacologists	
	Registered Nurses	
	Associate Degree Nurses	
	Recreational Therapists	
	Radiology Technologists	
	Mental Health Technologists	
	Mental Health Retardation Technologists	
	Certified Medical Assistants	
	Inhalation Therapists	
	Mechanics and Repairmen	
Office Machine Mechanics	Auto Mechanic Helpers	Small Engine Repair
Air Conditioning Mechanics	Auto Mechanics	Refrigeration
Appliance Repairmen	Aeronautical Mechanics	Instrument Maintenance and Repair
Airplane Mechanics	Auto Technologists	Air Conditioning
Diesel Mechanics	Appliance and Refrigeration Repair	Auto Mechanics
Electronic Mechanics		
Motor Vehicle Mechanics		
Radio and TV Repairmen		
Small Engine Repairmen		
	Metal Craftsmen	
Machinists and Related Sheet Metal Workers	Tool and Die Makers	Body and Fender Welding
	Ironworker Apprentices	

Table 11 (Continued)

Manpower Needs	Student Interest	Program Enrollment
Welders and Flame Cutters Auto Body Mechanics	Metal Craftsmen (Continued) Sheet Metal Apprentices Auto Body Helpers Auto Body Repair Workers Metal Fabrication Workers Machine Tool Workers Welders Machinist Apprentices Machine Shop Workers	Machine Shop Sheet Metal
168 Printing Craftsmen	Printing Craftsmen Graphic Arts Craftsmen Litho Printers	Graphic Arts Occupations
Policemen, Detectives and Sheriffs Security Guards	Protective Service Workers Law Enforcement Personnel	Police Science Law Enforcement Training
Sales Workers	Sales Workers Retail Salesmen Marketing and Distribution Workers	Advertising Services Apparel and Accessories Automotive

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Table 11 (Continued)

Manpower Needs	Student Interest	Program Enrollment
Draftsmen Civil Technicians Surveyors Electronic Technicians Commercial Artists Photographers	Technicians N.E.C. Electronics Technicians Aeronautical Technicians Civil Technicians Electricity Technicians Industrial Plastics Personnel Computer Technicians Air Conditioning and Refrigeration Technicians Air Traffic Control Technicians Cabinet Making Personnel Broadcasting Personnel Draftsmen Commercial and Advertising Artists Photographers	Electronic Technology Commercial Art Occupations Commercial Photography Occupations Drafting Occupations Electronic Occupations Plastics Occupations Woodworking Occupations Civil Technology Electric Occupations Electric Occupations Blueprint Reading Photography
Linemen	Transportation and Public Utilities Workers N.E.C. Linemen Electric Power and Distribution Personnel Commercial Pilots Women-Aviation Personnel Equipment Operation Personnel	Stationary Energy Sources Occupations Aviation Occupations Linemen

Table 11 (Continued)

Manpower Needs	Student Interest	Program Enrollment
Upholsterers Sewing Machine Operators	Textile Occupations Sewers Furniture Upholster Helpers Garment Cutters Tailors Clothing Service Personnel Industrial Sewing Machine Operators Drapery Construction Design Personnel	Clothing Management and Production Textile Production and Fabrication Leatherworking Upholstery

RANKING THE DATA

After the clustering process was completed, total employment, total enrollment, and total number of student references (student interest) were computed for each cluster. The clusters were ranked in descending order (largest cluster first, smallest cluster last) for each of the three categories, i.e., employment, enrollment and student interest. Table 12 presents the clusters, data on which ranks were calculated, and rank orders by category.

DISPOSITION OF HYPOTHESIS 1

Hypothesis 1 which states, "There is a significant positive correlation between the rank order of occupational clusters by student interest and the rank order of occupational clusters by manpower needs," was retained. The computed R was equal to .5367 which Borg (see Chapter 13) indicates is satisfactory for a crude group prediction. Table 13 contains the data used to compute R.

A review of the data listed in Table indicates that significant contributors to d^2 (259.50) were the Food Service Workers cluster (36.00), the Mechanics and Repairman cluster (25.00), the Metal Craftsmen cluster (25.00), the Technicians N.E.C. cluster (100.00), and the Agricultural Workers cluster (49.00). The Agricultural Workers cluster and the Food Service Workers cluster were ranked higher in demand than in student interest. The other three major contributing clusters ranked higher in student interest than in demand.

DISPOSITION OF HYPOTHESIS 2 (ALTERNATIVE 1)

Since Hypothesis 1 was retained, Hypothesis 2 (Alternative 1) was tested. This hypothesis states, "There is a significant positive correlation between the rank order of occupational clusters by student enrollment and the rank order of occupational clusters by a combination factor derived from manpower needs and student interest ranks." This hypothesis was retained. The computed R equals .6833 which is an accurate group prediction according to Borg's criteria. Table 14 contains the data used to compute R.

Table 12

Values and Ranks by Variable
and Occupational Cluster

Occupational Clusters	Manpower Needs (Demand)	Rank	Student Interest (No. of References)	Rank	Program Enrollment	Rank
Agricultural Workers	17,224	2	46	9	8,295	1
Clerical Workers	60,751	1	161	2.5	5,499	2
Construction Workers	4,248	8	58	8	937	8
Drivers and Deliverymen	5,275	7	43	10	81	15
Food Service Workers	11,411	6	25	12	99	14
Medical Workers	15,159	3	161	2.5	1,023	7
Mechanics and Repairmen	4,070	9	116	4	2,211	4
Metal Craftsmen	3,534	10	97	5	1,900	5
Printing Craftsmen	592	15	9	15	538	9
Protective Service Workers	1,404	12	24	13	214	11
Sales Workers	13,277	4	80	6	2,463	3
Service Workers N.E.C.	11,861	5	67	7	243	10
Technicians N.E.C.	1,672	11	176	1	1,502	6
Textile Occupations	1,086	13	34	11	133	12
Transportation and Public Utilities Workers N.E.C.	741	14	22	14	120	13

Table 13

Spearman Rank Coefficient Data for Manpower
Needs Versus Student Interest

Occupational Clusters	Manpower Needs Rank	Student Interest Rank	d	d ²
Clerical Workers	1	2.5	1.5	2.25
Agricultural Workers	2	9	7.0	49.00
Medical Workers	3	2.5	.5	.25
Sales Workers	4	6	2.0	4.00
Service Workers N.E.C.	5	7	2.0	4.00
Food Service Workers	6	12	6.0	36.00
Drivers and Deliverymen	7	10	3.0	9.00
Construction Workers	8	8	.0	.00
Mechanics and Repairmen	9	4	5.0	25.00
Metal Craftsmen	10	5	5.0	25.00
Technicians N.E.C.	11	1	10.0	100.00
Protective Service Workers	12	13	1.0	1.00
Textile Occupations	13	11	2.0	4.00
Transportation and Public Utilities N.E.C.	14	14	.0	.00
Printing Craftsmen	15	15	.0	.00
				$\Sigma d^2 = 259.50$

Table 14

Spearman Rank Coefficient Data for Program Enrollment Versus
An Average of Ranks of Student Interest and Manpower Needs

Occupational Clusters	Program Enrollment Rank	Student Interest Rank Plus Manpower Needs Rank Divided by Two	d	d ²
Agricultural Workers	1	5.5	4.50	20.25
Clerical Workers	2	1.75	.25	.06
Sales Workers	3	5	2.00	4.00
Mechanics and Repairmen	4	6.5	2.50	6.25
Metal Craftsmen	5	7.5	2.50	6.25
Technicians N.E.C.	6	6	.00	.00
Medical Workers	7	2.75	4.25	18.06
Construction Workers	8	8	.00	.00
Printing Craftsmen	9	15	6.00	36.00
Service Workers N.E.C.	10	6	4.00	16.00
Protective Service Workers	11	12.5	1.50	2.25
Textile Occupations	12	12	.00	.00
Transportation and Public Utilities Workers N.E.C.	13	14	1.00	1.00
Food Service Workers	14	9	5.00	25.00
Drivers and Deliverymen	15	8.5	6.50	42.25

$$\Sigma d^2 = 177.37$$

A review of the data listed in Table 14 indicates that significant contributors to d^2 (177.37) were the Printing Craftsmen cluster (36.00), the Drivers and Deliverymen cluster (42.25) and the Food Service Workers cluster (25.00). Enrollment ranked higher than the combined manpower needs--student interest factor in the Printing Craftsmen cluster. The Drivers and Deliverymen cluster and the Food Service Workers cluster ranked lower in enrollment than they ranked in the combined manpower needs--student interest factor.

FURTHER EXAMINATION OF THE DATA

Since Hypothesis 1 was retained on the basis of a relatively weak correlation, Hypothesis 2, A and B, (Alternative 2) were examined to determine if one of the two criteria, student interest or manpower needs, had received greater emphasis in past planning than the other criterion. The correlation between student interest and enrollment was .6384 (see Table 15) while the correlation between manpower needs and enrollment was .4893 (see Table 16). This indicates that student interest has received precedence as a planning criterion in the past.

Neither of these correlations was as great as the correlation between the rank of clusters based on a combination of manpower needs and student interest and the rank of clusters based on enrollment. (Note: This correlation was .6833: see Disposition of Hypothesis 2, Alternative 1). This indicates that while student interest received priority as a planning criteria, manpower needs was also considered in the planning process.

SUMMARY

The findings developed in this chapter indicate the following relationships between student interest, manpower needs and past vocational and technical education planning in Kansas.

1. Manpower needs and student interest are compatible criteria for planning vocational and technical education programs.
2. There is an extremely strong indication that planning in the past has been based on a combination of the student interest and manpower needs criteria.

Table 15

Spearman Rank Coefficient Data for Program
Enrollment Versus Student Interest

Occupational Clusters	Enrollment Rank	Student Interest Rank	d	d ²
Agricultural Workers	1	9	8.0	64.00
Clerical Workers	2	2.5	.5	.25
Sales Workers	3	6	3.0	9.00
Mechanics and Repairmen	4	4	.0	.00
Metal Craftsmen	5	5	.0	.00
Technicians N.E.C.	6	1	5.0	25.00
Medical Workers	7	2.5	4.5	20.25
Construction Workers	8	8	.0	.00
Printing Craftsmen	9	15	6.0	36.00
Service Workers N.E.C.	10	7	3.0	9.00
Protective Service Workers	11	13	2.0	4.00
Textile Occupations	12	11	1.0	1.00
Transportation and Public Utilities N.E.C.	13	14	1.0	1.00
Food Service Workers	14	12	2.0	4.00
Drivers and Deliverymen	15	10	5.0	25.00
				$\Sigma d^2 = 202.50$

Table 16

Spearmen Rank Coefficient Data for Program
Enrollment Versus Manpower Needs

Occupational Clusters	Enrollment Rank	Manpower Needs Rank	d	d ²
Agricultural Workers	1	2	1	1
Clerical Workers	2	1	1	1
Sales Workers	3	4	1	1
Mechanics and Repairmen	4	9	5	25
Metal Craftsmen	5	10	5	25
Technicians N.E.C.	6	11	5	25
Medical Workers	7	3	4	16
Construction Workers	8	8	0	0
Printing Craftsmen	9	15	6	36
Service Workers N.E.C.	10	5	5	25
Protective Service Workers	11	12	1	1
Textile Occupations	12	13	1	1
Transportation and Public Utilities N.E.C.	13	14	1	1
Food Service Workers	14	6	8	64
Drivers and Deliverymen	15	7	8	64
				$\Sigma d^2 = 286$

3. There is also a strong indication that student interest has been emphasized over manpower needs in past planning.

FOOTNOTES

¹Department of Health, Education and Welfare, Office of Education, Manpower Administration, Vocational Education and Occupations, (Washington: Government Printing Office, 1969), pp. 3-198.

Chapter 15

CONCLUSIONS, RECOMMENDATIONS AND SUMMARY

INTRODUCTION

This chapter contains a list of conclusions based on the findings of the study. Recommendations originating from the conclusions are indicated. A summary of the study completes the chapter.

CONCLUSIONS

The following conclusions were reached based on the findings of the study:

1. It is feasible to use a combination of student interest and manpower needs as a criterion for planning vocational and technical education.
2. It appears that Kansas vocational and technical education has been planned using a combination of manpower needs and student interest as one of several criteria.
3. In the past, it appears that Kansas vocational and technical education planners have used student interest more than manpower needs for planning purposes.
4. Since there is not a perfect correlation between manpower needs and student interest, a weighting scheme must be used when considering these two criteria in the planning process.
5. Some factors not investigated in this study have a marked influence on the program planning process. The combination of student interest and manpower needs account for approximately forty-seven percent ($.685^2$) of the planning for vocational and technical programs in Kansas. Separately, student interest accounts for approximately forty percent ($.49^2$) of the planning.
6. Despite the discovery of a significant positive correlation between the averaged ranks of occupational clusters for manpower needs and student interest, and the rank for program enrollment, discrepancies exist

between the two categories for certain occupational clusters. For example, Agricultural Workers have a noticeably higher rank for program enrollment than for the combined planning criteria. The Drivers and Deliverymen and Food Service Workers clusters rank higher for the combined planning criteria than for enrollment.

RECOMMENDATIONS

The following recommendations are made based on the conclusions reached in the study:

1. It is recommended that the Kansas State Department of Education continue to use manpower needs and student interest as dual criteria in the vocational and technical program planning process as outlined in the 1968 Amendments to the 1963 Vocational Education Act.

2. It is recommended that the Kansas State Department of Education develop a weighting system relative to the manpower needs and student interest criteria on which future vocational and technical programs should be based.

3. It is recommended that the Kansas State Department of Education establish a system to inform students about occupations where manpower needs are high and student interest is low. Implementation of the career education concept should provide an excellent opportunity for promulgating this information.

4. It is recommended that research be conducted to determine why discrepancies exist between ranks for the combined student interest--manpower needs factor and program enrollment in specific occupational clusters.

5. It is recommended that further research be conducted to determine what criteria other than manpower needs and student interest have been used to plan vocational and technical education in Kansas.

6. It is recommended that research be conducted to determine the effects occupational interests of specific types of students such as the disadvantaged, handicapped, different age groups, males and females have on the planning of vocational and technical programs in Kansas.

7. It is recommended that studies identical to the one just completed be conducted in the future to assess trends in manpower needs and student interests and their relationship to the planning process.

SUMMARY

This study was concerned with identifying the effect of authorized criteria on the planning of vocational and technical programs in Kansas. The criteria that were supposed to have been given serious consideration when establishing vocational and technical programs were manpower needs and student interest. In an effort to determine the effect of these criteria on the planning process, attempts were made to find relationships between manpower needs, student interest and program enrollment. Program enrollment was considered a direct measure of the program planning process.

Sample occupational data was acquired for the three categories. Amounts obtained for every occupation were clustered using census arrangements and ranked from the cluster with the largest amount to the cluster with the smallest amount for each category. Manpower needs amounts by occupation were obtained from the Kansas Employment Security Commission. Student interest amounts were acquired from the recorded occupational references to the K-VIEW system. Program enrollment amounts were represented by data obtained from the Division of Vocational Education, Kansas State Department of Education.

Several hypotheses were examined using the Spearman Rank Coefficient or Correlation to expose significant positive correlations between manpower needs, student interest and program enrollment. A set procedure was followed. If a significant positive correlation was found between the ranks for manpower needs and student interest, an average of the ranks for these two criteria would be compared with the ranks of program enrollment. A significant positive correlation between the combined factors and program enrollment would indicate that both manpower needs and student interest were used in the planning process.

If no significant positive correlation was found between manpower needs and student interest, the Spearman formula would be used to determine if either of the two criteria, when matched with program enrollment, predominated in the planning process.

The computed statistic for matching the ranks of occupational clusters for manpower needs and student interest indicated a significant positive correlation and compatibility of the two criteria. An average of the ranks of occupational clusters for these criteria compared with the ranks for program enrollment showed another significant positive correlation.

Since the correlation between the manpower needs--student interest factor and program enrollment was considered a weak group prediction of positive correlation by Borg, further analysis was conducted to explore the possibility of relationships between manpower needs and program enrollment, and student interest and program enrollment. The Pearson formula was used to compare the ranks of the occupational clusters for student interest to program enrollment. The same procedure was followed to determine the relationship between manpower needs and program enrollment. Results of these comparisons revealed that student interest showed a greater positive correlation with program enrollment than manpower needs.

The findings of the study were that (1) student interest and manpower needs are compatible criteria for planning vocational and technical programs, (2) a combination of student interest and manpower needs was probably used for planning vocational and technical programs in Kansas, and (3) student interest in contrast to manpower needs, most likely, predominated in the planning process.

One conclusion reached, based on the findings of the study, was that student interest and manpower needs are compatible criteria for planning vocational and technical education. It was concluded that a combination of manpower needs and student interest was used among several criteria in planning vocational and technical education in Kansas. Of these two criteria, student interest appears to have the greatest influence on planning.

The disclosure of a less than perfect correlation between program enrollment and a combination of student interest and manpower needs led to the conclusion that a weighting system should be used when considering these two criteria in the planning process. The influence of student interest, manpower needs and the student interest--manpower needs combination of the planning of vocational and technical programs resulted in the conclusion that factors other than manpower needs and student interest affect the planning of programs. The last conclusion was that noticeable differences existed between the ranks for specific occupational clusters when comparing the averaged ranks for manpower needs and student interest to program enrollment.

A list of recommendations was made based on the conclusions reached in the study. It was recommended that the Kansas State Department of Education be encouraged to continue using a combination of student interest and manpower

needs for planning vocational and technical programs. It was recommended that a weighting policy be established relative to the manpower needs and student interest criteria. The implementation of an occupational information system as a part of career education to inform students of career opportunities where demand is high and supply low was suggested. An investigation of the differences between the averaged ranks for student interest and manpower needs and the ranks for program enrollment for specific occupational clusters was prescribed.

Research was encouraged to determine what criteria other than manpower needs and student interest affect program enrollment. It was advised that the occupational interests of the disadvantaged, handicapped, different age groups, males and females be explored to discover their effect on the planning process. The final recommendation was that future studies identical to the one just completed be conducted to assess trends in manpower needs and student interests and how these criteria relate to vocational and technical program planning.

Part 4

AN ANALYSIS OF THE NET MANPOWER NEEDS IN THE KANSAS
CITY STANDARD METROPOLITAN STATISTICAL
AREA FROM 1972 THROUGH 1976

Brynjulv D. Norheim

Chapter 16

THE PROBLEM

INTRODUCTION

The 1968 Vocational Education Amendment Act requires, among other things, that vocational and technical education be directed toward preparing students for present or projected job vacancies.¹ The term "job vacancies" implies the difference between projected manpower demand and supply, i.e., net manpower needs.²

To meet this requirement, many states across the nation have initiated efforts to acquire manpower demand and manpower supply information.³ Once the objective of projecting net manpower needs has been achieved, states should be able to plan vocational programs to meet their internal manpower needs.

Although the achievement of planning on the basis of state manpower needs should greatly increase the relevance of vocational and technical education, many critical information needs will still exist.

Included in these critical information needs is the need for data on net manpower demand in local labor markets which cross state boundaries. For example, although both Kansas and Missouri have initiated efforts in the direction of projecting net manpower needs within their respective states, there has been little effort to forecast net manpower needs in the Kansas City Standard Metropolitan Statistical Area (SMSA) as a whole. (See Figure 6). During a two-state planning meeting held in the Kansas City SMSA, the need for a coordinated data base was identified. It is evident that educational planning for Kansas City, Kansas will be deficient without adequate information on the manpower situation in Kansas City, Missouri. On the other hand, educational planning in Kansas City, Missouri, will be inadequate without Kansas City, Kansas manpower data.

KANSAS CITY SMSA



Figure 6
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STATEMENT OF THE PROBLEM

This study was an attempt to generate and interface manpower demand data and manpower supply data in such a manner as to facilitate coordinated bi-state planning of vocational and technical education in the Kansas City, Kansas - Kansas City, Missouri area. In addition, this study attempted to analyze the present training situation in the SMSA in terms of past planning.

NEED FOR THE STUDY

At a meeting in Kansas City, Missouri in February, 1972, representatives from both states expressed the need to study manpower statistics in Kansas City, Kansas and Kansas City, Missouri jointly.⁴

The findings of this research project should be very beneficial to the state of Kansas and the state of Missouri for the following reasons:

1. It should facilitate coordinated educational planning between the two states for the Kansas City SMSA.
2. It should indicate areas where improved coordination would be most beneficial.
3. It may be used as a model in other situations where labor markets extend across state boundaries.
4. Planning based on this study could make education more relevant to the student and thus increase the chance that his training will provide him with education that leads to actual employment.

THE RESEARCH PROBLEM

The major problem in this study was to develop an interfacing of manpower demand and manpower supply for the Kansas City SMSA, which would provide estimates of net manpower needs by occupational clusters.

HYPOTHESES TO BE TESTED

The following hypotheses which are relevant to an examination of the past planning coordination in the Kansas City SMSA will be tested in this study:

Hypothesis 1

There is a significant difference between the distribution of manpower demand and manpower supply in the Kansas City SMSA.

Hypothesis 2

There is a significant difference between the proportion of manpower supply which is oversupply in the state of Kansas and the proportion of manpower supply which is oversupply in the Kansas City SMSA.

RESEARCH QUESTION

If there is a manpower oversupply in the Kansas City SMSA, what percent of this manpower oversupply is found in situations where neither state produces an oversupply for a particular occupation but the combined training for this occupation produces an excess of manpower supply?

ASSUMPTIONS

The assumptions on which this study was based include the following:

1. The percent of vocational training graduates who enter the labor market from any given program will remain reasonably constant over the next five years and can be forecasted from past student follow-up data gathered by the Kansas State Department of Education and the Missouri State Department of Education.
2. The vocational program graduate output will remain relatively constant over the next five years and can be predicted from past records.
3. Private school graduate output will remain reasonably constant over the next five years and can be predicted from past records.
4. Manpower demand data generated by the Department of Labor using the Bureau of Labor Statistics Matrix for the Kansas City SMSA, which projects manpower demand for the next five years, will be reasonably accurate.

LIMITATIONS AND DELIMITATIONS OF THE STUDY

The study will be delimited and limited as described in the following statements.

1. Only the Kansas City SMSA will be examined.
2. Only jobs that are sub-professional in nature and are normally considered to be within the scope of vocational and technical education will be considered.
3. The analysis will be based on data projections from 1972-1976.
4. Mobility of supply in and out of the Kansas City SMSA could not be considered.

SUMMARY

As indicated in the 1968 Vocational Education Amendments, vocational and technical education should prepare students for actual job opportunities. This implies a need for data which projects manpower demand and supply. Although a number of manpower projection methods have been developed, many problems still exist. One such problem is to project manpower needs and supply in local labor markets which cross state boundaries. Some educational planners in the states of Kansas and Missouri recognized the need for manpower information for the Kansas City SMSA to help implement coordinated educational planning in that area. This study will develop an interfacing of manpower demand and manpower supply for the Kansas City SMSA to estimate the net manpower needs.

Two hypotheses will be tested. Hypothesis 1 was stated to determine whether there is a statistical discrepancy between manpower demand and manpower supply in the Kansas City SMSA. Hypothesis 2 was stated to determine whether there is a significant difference between manpower oversupply in the state of Kansas and the Kansas City SMSA. The research question considers the percent of manpower oversupply in Kansas City SMSA that is accounted for in situations where combined training produces an excess of manpower supply.

FOOTNOTES

¹United States Statutes at Large, 90th Congress, 2D Session, 1968, Vol. 82 Public Law 90-576, (Washington: Government Printing Office, 1968), pp. 1064-1098.

²Paul V. Braden et al., The Occupational Training Information System - Final Report. (Stillwater: Oklahoma State University Research Foundation, 1970), pp. T-3.

³Statement by James L. Harris, K-MUST project Director, personal interview, January 15, 1972.

⁴Opinion expressed by Wilbur Rawson, Kansas State Supervisor of Exemplary and Special Needs; Robert Scott, Associate Professor and Principal Investigator of K-MUST; Howard Kittleson, Associate Professor, Kansas State University; Glen White, Director of Research Coordinating Unit, Missouri; and Frank Drake, Associate Director of Vocational Education, Missouri, in a meeting in Kansas City, on February 29, 1972.

Chapter 17

REVIEW OF THE LITERATURE

INTRODUCTION

This chapter is concerned with a review of related literature and research, as well as information that identifies and defines key concepts used in this study.

DEFINITIONS OF TERMS

The following definitions apply to the terminology which is unique to this investigation.

Bureau of Labor Statistics (BLS)

The Bureau of Labor Statistics is a component of the Department of Labor which has the primary responsibility of the technical development and statistical adequacy of the matrix system used to project national manpower needs.¹

Experimental Employer Needs Survey

The Experimental Employer Needs Survey is a refined modification of the Area Skill Survey Technique used to project manpower needs. The Area Skill Survey Technique is conducted by means of a mail or interview questionnaire which asks individual employers to forecast their employee requirements for a project period, taking into account both replacement and expansion needs.

Kansas Manpower Utilization System for Training (K-MUST)

This is a management information system for vocational technical education planners. Its principal functions include projection of manpower needs and supply for occupational forecast areas in Kansas.²

Labor Force

The Labor Force is the total number of workers available minus the size of the armed forces and assuming a national unemployment rate of three percent.³

Labor Market

The labor market is the total number of jobs available in the economy.

Manpower

Manpower is defined as an economic resource just as material, equipment and electric energy are economic resources.⁴

Manpower Demand

Manpower demand is defined as the total number of measured or projected skilled persons needed during the time period under consideration, categorized according to specific skill, or skill cluster.⁵

Manpower Forecast

The term, manpower forecast, refers to an estimate of manpower requirements at some future date based on certain assumptions and economic analysis, with a large element of human judgment; used synonymously with projection.⁶

Manpower Supply

Manpower supply is defined as the total number of measured or projected skilled persons available during the time period under consideration, categorized according to specific skill or skill cluster and the supply source where this skilled person is located.⁷

Net Manpower Need

The net manpower need is the difference between the projected manpower demand and manpower supply.

Occupation

The term occupation relates to one specific type of job as identified by the census. In the event that a person holds two jobs, the job at which he worked the most hours during a week is that individual's occupation.⁸

Standard Industrial Classification (SIC)

This is a system whereby each industry is assigned a code on the basis of its major activity, which is determined by the product or group of products produced or handled, or services rendered. The structure of the system makes it possible to classify establishments by industry on a two digit, a three digit, or a four digit basis, according to the degree of detail in information which may be needed.⁹

Standard Metropolitan Statistical Area (SMSA)

This area is defined as a county or group of contiguous counties which contains at least one city of 50,000 inhabitants or more, or "twin cities" with a combined population of at least 50,000. In addition to the county or counties containing such a city or cities, contiguous counties are included in an SMSA if, according to certain criteria, they are socially and economically integrated with the central city.¹⁰

RELATED LITERATURE AND RESEARCH

Recently, many western countries have questioned the relevance of their educational programs. Education has been mandated to prepare human resources for the manpower needs of society and yet must prepare an individual in such a manner that his potential is utilized to the fullest extent possible.¹¹ There is a very real possibility however, that training all persons to the maximum extent of their abilities may not provide society with the manpower necessary to function efficiently. Some have suggested, that it is not true that persons trained for high level occupations can necessarily be successful functioning in sub-professional occupations.¹² The dichotomous purpose of education has become a critical problem for the educational planners of today.

This leads to the question as to whether a discrepancy between students' potential, desires, abilities and interest, and the needs of society is unavoidable in the present environment. Casmey¹³ indicated that a partial solution to this conflict does exist when he stated:

the majority of students in secondary and higher education state their educational goals in terms of occupation...educators should capitalize on the motivational potential it holds, to help the students select appropriate educational programs and more realistic goals.

In other words, many students would probably adjust their educational goals in terms of the occupational opportunities available thereby bringing agreement between the needs of society and the needs of the individual.

In the United States, only seventeen percent of the occupations require a baccalaureate degree and yet seventy-five percent of the youth are enrolled in college preparatory or general education programs.¹⁴ On the other end of the spectrum, high school graduates without vocational training have an unemployment rate of 24 percent, whereas graduates with vocational training are unemployed at the rate of 5.2 percent.¹⁵ No longer can it be said that a college degree is the best and surest route to occupational success.

Recent research on the Kansas situation indicated that 47.5 percent of the presently enrolled high school students claimed to be enrolled in college preparatory curriculum and 38.5 percent in general education curriculum. Only 14 percent claimed to be presently enrolled in vocational training programs.¹⁶ It would appear that educational planning to meet the needs of society has either been neglected or ignored. Toffler in his book, Future Shock¹⁷ describes the present planning situation by saying:

Our schools face backwards toward a dying system rather than forward to the emerging new society...we must search for objectives and methods in the future, rather than in the past.

McLuhan and Leonard¹⁸ also supported the notion of looking forward into the "untested country of the present and future."

The two major purposes of American education have been (1) preparation for living, and (2) preparation for making a living.¹⁹ With the current emphasis on Career Education, a change from the past toward the future can be sensed. Whereas in the past, the major concern has been to prepare students for a living, the current trend through Career Education is to stress the importance of making a living.

The need for change in educational planning was strongly advocated by a number of authorities. Casme²⁰ recently remarked:

...the forces of change are altering longheld American attitudes toward the utilization and consumption of the country's human resources. We are beginning to understand the connection between strength as individuals and as society. We have begun to see the need for a planned relationship between manpower needs and educational programs.

Pucinski²¹ stressed the significance of this, particularly in the area of technical education, indicating, "such programs must keep abreast of the

economic changes of the seventies and tune in to the manpower needs which have been forecasted for this decade." Venn²² also pointed out the concern with the problem of manpower development and the relevancy of educational planning.

During the last decade, federal manpower legislation has strongly emphasized the need for vocational education to be based on manpower demands of the local community, the state and nation.

The following nine acts have specifically contributed to emphasize this planning factor:

1. The Area Redevelopment Act of 1961,²³
2. The Manpower Development and Training Act of 1962,²⁴
3. The Vocational Education Act of 1963,²⁵
4. The Higher Education Facilities Act of 1963,²⁶
5. The Economic Opportunity Act of 1964,²⁷
6. The Civil Rights Act of 1964,²⁸
7. The Higher Education Act of 1965,²⁹
8. The Appalachian Act of 1965,³⁰
9. The 1968 Amendments to the 1963 Vocational Education Act.³¹

Currently, the most influential federal legislation affecting vocational education is the 1968 Amendments to the 1963 Vocational Education Act. This act states that it is the responsibility of vocational educators to provide vocational training which is "realistic in the light of actual or anticipated opportunities for gainful employment."³²

In the Act, it is implied that vocational education should be directed towards entry level employment of graduates. One of the major considerations to be taken into account in planning education to meet this objective is the types of employment that will be available in the future.

The State Employment Security Commissions were given the responsibilities of "making available to the State Board and local agencies occupational information regarding reasonable prospects of employment in the community and elsewhere..."³³ In many instances, the State Employment Security Commissions have not been able to meet this responsibility. This problem was pointed out by Medvin³⁴ when he stated:

The State Employment Services with no additional funding and with the traditional and costly skill survey technique available to them, have in many instances been unable to furnish the information which by law they are obligated to provide.

Realizing the inability of the State Employment Services to conduct manpower skill surveys, the Department of Labor has funded research projects to meet the immediate need for manpower projections in various states.

There are basically three methods for predicting the future manpower need: statistical, econometric and judgmental. Although none of these methods produce absolutely accurate figures of future requirements, exactness in quantitative terms is unnecessary for planning. Manpower forecasting can serve many useful purposes in decision-making when it is only roughly right rather than perfectly correct.³⁵

Hartzler³⁶ classified present forecasting methods as one of two types: macroeconomic and microeconomic. It is apparent that these fall under the econometric models, and therefore are markedly influenced by the sociopolitical processes in a society. The macroeconomic type forecasts for national or large regional needs whereas the microeconomic type forecasts for small local areas. The latter is the type under consideration in this study.

The review also showed that manpower forecasting must be seen in relation to the overall economic and political system of a nation, and that national manpower planning policies and research must take into account several interdependent subsystems of the larger economic system.³⁷

National manpower planning is most unlikely to be valid unless it takes into account all such subsystems, including the large subsystem which is often overlooked, that is, the subsystem made up of the young people in various stages of education and pre-employment training.³⁸

It is imperative that educational programs need to be based on the best possible set of assumptions about the future. Lester³⁹ indicated that:

Investment in education is based on a set of assumptions about the future. For the individual, the firm, the community, and the nation, training for work involves forward planning.

According to Toffler⁴⁰ we need to:

...generate successive, alternative images of the future assumptions about the kinds of jobs, professions and vocations that may be needed twenty to fifty years in the future...it is by generating such assumptions, defining, debating, systemizing and continually updating them, that we can deduce the nature of the cognitive and affective skills that people of tomorrow will need to survive the accelerative thrust.

However, most manpower projection experts agree that among present projection methods, no quantitative forecasting of occupational needs beyond ten years is sufficiently reliable.⁴¹

Weinstein⁴² pointed out the importance of good quality data to satisfy management needs, and stated that:

Too frequently, the data we obtain from Social Services and other departments seem largely designed for some future fishing expedition by fellow researchers and not necessarily geared to the managerial problems faced by public and private decision makers.

Somers⁴³ observed that vocational education reacts only sluggishly to industrial change, and a good part of this slow reaction can be attributed to bad data. During the past years, however, many sophisticated forecasting system models have been developed to aid vocational education planners. Such system models should reflect the overall relationship between manpower policy, the educational system and societal manpower needs. According to Morton⁴⁴

information systems must be established to obtain a picture of what we look like at any given time. Today, these information systems are mostly inadequate or non-existent. Data, both as to students and to dollar expenditures, must be put into automated data retrieval systems, so that the profile of vocational technical and occupational training at local, state, or national levels can be determined at any time.

The manpower projection system models that are most relevant to this study will be discussed below.

The Michigan Study⁴⁵ was an attempt to forecast occupational manpower needs over a period of 15 years. It was designed to develop estimates of future labor demand by industry, occupation and educational attainment and to determine the future labor force by age, sex and educational attainment. A cross-sectional occupational educational matrix was the resultant of supply and demand forces. The imbalances were termed "shortage" or "surplus."

The implicit assumptions that Michigan's industrial character will remain largely unchanged for 15 years, and that the educational distributors of various occupations will remain unchanged would appear to be questionable according to Kidder,⁴⁶ who evaluated this and other forecasting models.

Arnold's Pennsylvania Study⁴⁷ in contrast to the Michigan Study, involved close analysis of the adequacies of institutional supply sources. Projections were made by applying BLS national change factors to state-level occupational distributions. The annual needs were filled in by employing straight-line projections. Arnold also made a thorough analysis of the socio-economic trends that might be expected to change the structure of Pennsylvania's industrial and occupational system. The data base of this study was much more

comprehensive than the data generated in the Michigan study. The significance of this study, relevant to vocational education planners, was the major consideration of institutional supply forces, especially vocational-technical schools.

The Occupational Training Information System (OTIS)⁴⁸ represented rather unique features in that it included: a technique for critical self-evaluation, recycling for each year, a recognition of the interaction between forecasting and the sociopolitical environment and finally a subsystem which related the labor market to "disadvantaged" workers. The demand data were received from employers, and the supply data were determined from both public and private vocational education systems. In addition, non-institutional supply sources were estimated from records of the state employment security office. The demand and supply information was then matched by occupation to produce the net manpower need. Current and projected state and regional imbalances, by occupations, were then calculated. The system yielded supply demand parameters, along with parameters of cost/benefit analysis of the system. The OTIS model was not only an attempt to generate projected manpower requirements, but also to develop a state-level information system. For this reason it employed a survey technique to generate data from institutional surveys.

Kidder⁴⁹ concluded that the OTIS was a well-conceived method for assembling and organizing labor market information, and complemented the system for the interaction it produced between interested groups from industry and education itself. Several points of criticism, however, could be applied to OTIS, perhaps most of all to the aspect of expected demand. The percent of expected demand which was filled from each supply source, was based on the percent of supply currently emanating from that source. One has no way of knowing the extent to which employers prefer this pattern or how generally optimal the pattern is in an economic sense. Also, not all jobs were included in the projections. This gap was expected to cause an understatement of the demand.

Kansas Manpower Utilization System for Training⁵⁰ (K-MUST) was primarily a modification of the OTIS system. The K-MUST model departed essentially from the OTIS model in the demand phase of the system.

Whereas the demand data in OTIS were gathered by means of the employer needs survey technique, the K-MUST model made use of the BLS matrix technique. The BLS matrix was modified to produce manpower needs projections for small labor markets which were accurate enough to serve as a tool for planning vocational and technical education. This modified technique, known as the Innis Technique⁵¹ made use of the following steps:

1. The Standard Industrial Classification Structure (SIC) of the local community was determined.
2. The projected expansion of employment for the projection period based on SIC expansion rates was determined.
3. An occupational profile of the expansion was determined.
4. The need for replacement of workers in various occupations was determined.
5. The replacement needs and expansion needs to determine total manpower needs were summed.

Medvin⁵² recommended that manpower surveys should be broken down into a number of smaller geographical components such as State Vocational Education districts or Standard Metropolitan Statistical Areas (SMSAs).

In an attempt to develop a cooperative plan of vocational and technical education in the Ozark Region, Kittleson⁵³ indicated that the effects of vocational and technical education planning were not confined within state boundaries. Manpower supply and demand decisions in Arkansas, Kansas, Louisiana, Missouri and Oklahoma which have regional implications should not be independent. The establishments of a regional net manpower demand system would likely investigate other cooperative effects within the project such as:

1. A cooperative regional vocational and technical information system for students seeking career information,
2. cooperative strategies for evaluation,
3. cooperative attempts to follow-up graduates, and
4. cooperatively designed strategies for funding vocational and technical education programs.

It was further emphasized that of special importance in cooperative planning were the Fort Smith region, and the Kansas City, Kansas and Kansas City, Missouri Area. The latter is the region investigated in this study.

SUMMARY

The key concepts used in this study were defined in the first part of this chapter. In the related literature and research it was found that the relevance of educational programs have been criticized increasingly over the past. Educational planners face the dualistic problem of combining manpower needs with students' potential and interest.

A discrepancy in American education was revealed in that a major part of the educational programs prepare students for college degrees, whereas less than twenty percent of the occupations require college education. Several noted writers emphasized the need for a change in educational planning and the need for manpower information systems. At least nine federal acts have contributed to emphasize this planning aspect. State employment services have been unable to conduct required manpower projects to determine future manpower needs adequately. Several federally funded manpower projects to develop manpower information systems were reviewed.

The need for a manpower information system for the Kansas City, Kansas and the Kansas City, Missouri area was emphasized in a proposed cooperative plan for vocational and technical education in the Ozark region.

FOOTNOTES

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⁴⁹Kidder, op. cit., p. 35.

⁵⁰Division of Vocational Education, et al., loc. cit.

⁵¹James L. Harris and Robert E. Scott, "Techniques used to Project Manpower Needs." (unpublished paper Manhattan, Kansas: Kansas State University, 1973).

⁵²Norman Medvin, Manpower Information for Vocational Education, ed. Robert C. Young. (Columbus: Ohio State University's Center for Vocational and Technical Education, 1969), p. 7.

⁵³Statement by Howard Kittleson, Assistant Professor, Kansas State University, personal interview, November 3, 1972.

Chapter 18

DESIGN OF THE STUDY

INTRODUCTION

It is the purpose of this chapter to describe the general procedures, data collection procedures, statistical tools and analysis techniques used to test the hypotheses and examine the research question and problem presented in Chapter 16.

GENERAL PROCEDURES

The manpower demand data used in this study were generated by the regional office of the Bureau of Labor Statistics in Kansas City, Missouri in conjunction with the Kansas Employment Security Commission (ESC). The writer was involved with the regional office and the state Employment Security Commission in this effort. The involvement consisted of meetings to discuss technical problems. The general approach used to develop the demand data was the BLS Matrix Method A.

The manpower supply data from public training were obtained from the Kansas State Department of Education. The manpower supply data from private schools were gathered using a mail survey of the private schools in the Kansas City SMSA. Data from the private schools included the average annual number of graduates by type of training. The Manpower Development and Training Act supply data were provided by MDTA Sections of the Kansas Department of Education and the Missouri Department of Education.

A preliminary analysis was performed by interfacing demand and supply data according to the format designed by the K-MUST Project. This analysis resulted in an estimate of the net manpower needs in the Kansas City SMSA. At this point, the research problem phase of the study was completed.

Using data from the preliminary analysis, hypothesis 1 was tested. By combining the data from the second annual K-MUST report and the data from

the preliminary analysis, it was possible to test hypothesis 2 at this time.

A further analysis of the Kansas City SMSA data was conducted to provide an answer to the research question.

DATA COLLECTION

Data needed (1) to serve as an input to the solution of the research problem presented in this study, (2) to analyze the hypotheses examined in this study, and (3) to answer the research question posed in the study including manpower demand and supply figures for 1972 through 1976 in the Kansas City SMSA by occupation or type of training.

The manpower demand data were developed by the regional office of the Bureau of Labor Statistics working in conjunction with the regional office of the Manpower Administration and the Kansas Employment Security Commission. The technique used was the Occupational - Industry Matrix Approach which is more commonly called the BLS Matrix Technique. More Specifically, Method A of the approach was applied. The data represent the needs for workers by occupation and occupational cluster. There are 162 occupations or occupational clusters forecasted by the technique of which 91 are relevant to the type of training provided by vocational and/or technical education.

Some of the occupational clusters were disaggregated so that an interfacing of jobs with training programs would be possible. When clusters were broken down, the techniques used by the K-MUST staff for producing similar figures for the Kansas labor market were employed. This breakdown technique utilizes data from the Occupational Outlook Handbook to calculate the data for occupations which are clustered in the BLS Matrix Approach output.

Manpower supply figures for public training and MDTA training in the SMSA were gathered from the Kansas Department of Education and the Missouri Department of Education. The public school data were collected from standard OE 3139 forms. (Note: This is a Federal Office of Education Report which is submitted annually by each state for the Kansas City SMSA. See Appendix G for an example of this form). Since the study is only concerned with workers

being produced for the labor market, the "graduates available for placement" column on the OE 3139 forms was used. The MDTA data were collected from the annual MDTA report produced by each state. Seventy-eight percent of the graduates were considered to be available for placement since past history indicates that this percentage is applicable.

Private schools in the Kansas City SMSA were surveyed to determine the annual manpower output from this source. (Note: See Appendix H for an example of the form and cover letter used in this survey). The number of graduates annually produced by private schools was divided in half as an estimate of the graduates available for placement. The fifty percent factor used was based on research done by the OTIS staff in Oklahoma.

These figures reflect the annual manpower supply being produced presently. It was necessary to multiply these figures by five to determine the supply of manpower over the next five years if the vocational and technical program mix does not change. It is, of course, hoped that the supply will be adjusted to better meet the demand and therefore cause these figures to be obsolete. Generally speaking, the data in Table 17 reflects the manpower situation if educational planners do not modify the training offered and, hence, should provide guidelines as to what changes might be made.

STATISTICAL TOOL

One statistical tool was selected to analyze the hypotheses in this study. Both hypotheses require the use of the Chi Square Test of Independence.

This statistical tool is normally described in standard behavioral statistics textbooks. According to Roscoe¹ the Chi Square Test of Independence is by far the most valuable of the Non-parametric procedures available to the behavioral scientist. It is an extremely useful statistical procedure for determining whether two nominal (or higher level) measures are related. If one of the variables is group membership and the other a criterion of some sort, the test may be used to determine whether two or more populations are distributed in the same fashion with respect to the criterion.²

With regards to hypothesis 1 in this study, the occupational categories represent the criterion on which the groups are distributed, whereas the demand

and supply data constitute membership in two different groups. Hypothesis 2, on the other hand, uses total supply data and total oversupply data as the membership groups, while Kansas and Kansas City SMSA constitute the criteria on which the groups are distributed.

The size of the Chi Square value is determined by the discrepancies in the match of the two data groups with respect to the criterion; the value being higher where the discrepancy is greater. If the calculated Chi Square value equals or exceeds some pre-determined value, then a significant difference is said to exist. The confidence level in which this statement can be made depends on the predetermined value selected. In this study, ninety-five percent confidence (.05 level) will be acceptable and, hence, the value will be selected on this basis.

The first step in determining the Chi Square value is to construct a bivariate frequency table, and determine the marginal frequencies. With respect to Hypothesis 1, the rows of the table include occupations and the columns include membership groups. For example, if the projected demand for salesworkers was fifty, then the entry in the cell that was in the demand column and the salesworkers row would be fifty.

In regards to Hypothesis 2, a two-by-two bivariate frequency table is constructed so that the rows constitute the following two criteria; the state of Kansas and Kansas City SMSA. The columns will represent the total projected supply and the oversupply data. For example, if the projected total supply for Kansas is a thousand, the entry in the cell in the Kansas row and the total supply column would be a thousand.

Once the data have been arranged in this fashion, the marginal frequencies are determined by summing the values in the columns and rows. The next step is to compute the expected frequencies. The expected frequencies are the values which would exist in the cells if the row and column sums did not change and if the distributions were proportional. The expected frequency for each cell is derived by multiplying the row total times the column total and dividing by the total of all entries. The following formula can be applied:

$$E_{ij} = \frac{R_i C_j}{N}$$

where:

E_{ij} = the expected frequency for cell in row i , column j

R_i = the sum of the frequencies in row i

C_j = the sum of the frequencies in column j

N = the sum of the frequencies for all cells

The Chi Square of each cell is computed by squaring the differences of the cell's expected frequency and observed value, and dividing by the expected frequency. The Chi Square value is the sum of all Chi Squares in the cells.

The predetermined value for the ninety-five percent confidence level is computed with the following formula:

$$\chi^2_{\alpha} = \frac{1}{2}(\chi_{\alpha} + \sqrt{2df-1})^2$$

In this formula, χ^2_{α} stands for the pre-determined or tabular Chi Square value, df stands for degrees of freedom and χ_{α} is the α -point of the cumulative normal distribution.

When degrees of freedom are greater than 30, but less than 100, linear interpolation is used.

The degrees of freedom are determined by multiplying the number of rows minus one, times the number of columns minus one. The loss of one degree of freedom for columns and rows respectively is due to the fact that there is one cell in each row and column which is not free to vary as the row and column totals are fixed.

Again, if the computed Chi Square value is equal to or exceeds the tabular value, then a significant difference is said to exist between the two distributions.

ANALYSIS TECHNIQUES

The analysis techniques used to (1) solve the research problem, (2) examine the hypotheses and (3) answer the research question are explained below.

The Research Problem

The research problem which states "The major problem in this study

is to develop an interfacing of manpower demand and manpower supply for the Kansas City SMSA which will provide estimates of net manpower needs by occupational cluster" was solved by implementing the following steps.

First, manpower training programs and occupations were grouped with each grouping reflecting an occupation or set of occupations matched with training programs which produce workers for those occupations. The K-MUST report was used as a model for this interfacing.

Secondly, the manpower demand for each occupation or set of occupations was then calculated using the BLS Matrix output data. When data on an occupation that was in a Matrix cluster were needed in detail for the interfacing, total national employment for all occupations in the cluster was computed and divided into the national employment figure for the given occupation to derive a percentage of workers in the cluster who are in the given occupation. This percentage was then multiplied times the cluster figure to give the estimate of the demand for workers in that occupation. National employment figures were taken from the 1972-73 Occupational Outlook Handbook.

Thirdly, the manpower supply estimates for each grouping (based on "graduates available for placement" produced by training programs in the grouping) were computed.

Fourthly, manpower supply figures from the three sources were summed to determine the total manpower supply in each grouping.

Finally, the supply for each grouping was subtracted from the demand in that grouping to determine the net manpower needs for that type of training/worker.

Hypothesis 1

Hypothesis 1 which states, "There is a significant difference between the distribution of manpower demand and manpower supply in the Kansas City SMSA" was tested in the following manner:

The manpower demand figure for each grouping was entered in cell $_{1,i}$ and the corresponding total manpower supply figure was entered in cell $_{2,i}$ of the bivariate frequency table. Once the data had been entered in the table, the Chi Square Test of Independence was conducted and the disposition of the hypothesis was determined.

Hypothesis 2

Hypothesis 2 which states, "There is a significant difference between the proportion of manpower supply which is oversupply in the state of Kansas and the proportion of supply which is oversupply in the Kansas City SMSA" was examined in the following manner:

The oversupply was calculated for the Kansas City SMSA by summing all net manpower needs figures which had a negative sign, i.e., instances of groupings where the supply is greater than the demand. The same procedure was used to calculate the oversupply in the state of Kansas using K-MUST data.

The total supply for all occupations in the respective areas (the Kansas City SMSA and the state of Kansas) was computed by summing all supply in each area.

The oversupply in the Kansas City SMSA was entered in cell_{1,1}; the oversupply in the state of Kansas was entered in cell_{1,2}; the supply in the Kansas City SMSA was entered in cell_{2,1} and the supply for the state of Kansas was entered in cell_{2,2}. The Chi Square Test of Independence was then performed using these data and the disposition of the hypothesis was determined.

Research Question

The research question which states, "What percent of the manpower oversupply in the Kansas City SMSA is found in situations where neither state produces an oversupply for a particular occupation, but the combined training for this occupation produces an excess of manpower supply" was answered in the following manner:

The supply in oversupply clusters was broken into supply from each state. When the supply from both states was less than the oversupply for the cluster, the oversupply was added to the total oversupply attributable to the situation described above. When this was not the case, the oversupply was added to the total oversupply not attributable to the situation. When all oversupply clusters were analyzed, the sum of the oversupply in situations where neither state was oversupplying by itself but was producing an oversupply in combination with the other state, was divided by the total oversupply. The total oversupply was calculated by adding the two totals calculated above.

SUMMARY

In this chapter the design of the study was explained. The general procedure included data collection from various sources, a preliminary analysis, statistical tools used to test the two hypotheses and a special analysis of the data to answer the research question.

The manpower demand data were obtained from the regional office of the Bureau of Labor Statistics in Kansas City, Missouri. The manpower supply data were obtained from Kansas State Department of Education, Missouri State Department of Education, and the private schools in Kansas City SMSA. A preliminary analysis was performed by interfacing demand and supply data to determine the net manpower needs in the Kansas City SMSA. With these data, the two hypotheses were tested using the Chi Square Test of Independence. This statistical tool was described and finally the analysis techniques for the study were explained.

FOOTNOTES

¹John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences, (New York: Holt, Rinehart and Winston, Inc., 1969), p. 203.

²*Ibid.*, p. 196.

Chapter 19

FINDINGS

INTRODUCTION

This chapter is concerned with presenting (1) an interfacing of manpower demand and manpower supply in the Kansas City SMSA, (2) the disposition of hypotheses 1 and 2, and (3) a discussion of findings as they relate to the research question.

DEMAND AND SUPPLY INTERFACING

The research problem as expressed in Chapter 16 states "The major problem in this study was to develop an interfacing of manpower demand and manpower supply for the Kansas City SMSA, which would provide estimates of net manpower needs by occupational clusters." Table 17 gives the interfacing developed under the strategy described in Chapter 18. All data refer to the 1972-1976 period inclusively.

The first column in Table 17 contains occupational clusters while the last column contains training program clusters. The clusters are grouped in such a manner that related occupations and training programs are matched. The second column contains manpower needs by occupation and figures are listed opposite occupations. The next three columns contain an estimate of the number of vocational and technical program graduates who will be entering the labor force soon after graduation. The sixth column contains an estimate of the number of vocational and technical program graduates who will be entering the labor force following a delay of five months or more after graduation. Column seven contains an estimate of non-vocational public training graduates who will be entering the labor force. Column eight contains an estimate of the trainees from Manpower Development Training programs, trainees from Apprenticeship programs, and trainees from Bureau of Corrections programs who will enter the labor market. Column nine contains an estimate of the number of private school graduates who will enter the labor

Table 17

Net Subprofessional Manpower Needs
In Kansas City SMSA (1972-1976)

Clusters Of Occupations	Manpower Needs	Manpower Supply							Net Manpower Needs	Clusters Of Training Programs
		Public Schools						Private Schools		
		Vocational - Technical				Non-Vocational Public Training	Bureau of Apprenticeship, Manpower Development Training, and Bureau of Corrections			
		Secondary	Post Secondary	Adult Preparatory	Delayed Entries					
Farmers & Farm Wkrs	128					74			54	Production Ag
Ag Mechanics	22									
Other Related Mechanics	374									
Total	396								396	Ag Mechanics
Groundskeepers & Nursery Workers	465	30			7				428	Horticulture
Ag Sales Workers	1072									
Ag Service Workers	473									
Ag Processing Wrks	801									
Total	2346							1536 1536	810	Ag Sales & Service Ag Products
Workers in Conserva- tion & Management of Natural Resources	160									
Total	160								160	Ag Resources Ag Forestry
Advertising Agents & Salesworkers	47	29	10		5				3	Advertising
Finance & Credit Wkrs	39	17	2						20	Finance & Credit

Table 17 (continued)

Clusters Of Occupations	Manpower Needs	Manpower Supply							Net Manpower Needs	Clusters Of Training Programs
		Public Schools						Private Schools		
		Vocational - Technical				Non-Vocational Public Training	Bureau of Apprenticeship, Manpower Development Training, and Bureau of Corrections			
		Secondary	Post Secondary	Adult Preparatory	Delayed Entries					
Manufacturing Salesmen	570	12	5		2				551	Industrial
Insurance Salesmen	590	6	1		1				582	Insurance
Service Station Attendants	466	17	2		3		68		376	Petroleum
Real Estate Agents	158	2							156	Real Estate
Other Salesworkers N. E. C.	4227							500 25		Airline Personnel Apparel & Accessories Automobile Floristry Food Distribution Food Services General Merchandise Hardware & Building Home Furnishings Hotel & Lodging International Trade Personal Services Recreation & Tourism
		60	16		13					
		26	2		4					
		7	2		1					
		72	10		11					
		141	1		35					
		425	72		65					
		21	19		5					
		9	9		2					
		36			5					
		21	4		3					
Total	4227	818	135		144			525	2605	
Dental Assistant	158		40					200	(82)	Dental Assistant
Dental Hygienist	66								66	Dental Hygienist
Dental Lab Tech	22								22	Dental Lab Tech
Licensed Practical Nurse	1395		1364						31	LPN Training
Medical Assistant	359							480	(121)	Medical Assistant
Medical Lab Asst	86								86	Medical Lab Asst

Table 17 (Continued)

Clusters Of Occupations	Manpower Needs	Manpower Supply							Cluster Of Training Programs	
		Public Schools						Private Schools		
		Vocational - Technical				Non-Vocational Public Training	Bureau of Apprenticeship, Manpower Development Training, and Bureau of Corrections			
		Secondary	Post Secondary	Adult Preparatory	Delayed Entries					
Medical Secretary	82									
Medical Record Clrk	56									
Ward Clerk	67							150		Medical Record Secretary
Total	205							150	55	
Nurse Aide	2635	10		825			95		1705	Nurse Aide
Registered Nurse	2311					288				Diploma Nurse
						504				Baccalaureate Nurse
			228							Associate Degree Nurse
Total	2311		228			792			1291	
Teacher Aide	95									Child Care & Guidance
Child Care Ctr Wkrs	142									
Pvt Household Child Care	592	100								
Total	829	100							729	
Laundry Workers	852									Clothing Management Production & Service
Sewers & Stitchers	193	120								
Total	1045	120							925	
Cooks	2112									Quantity Foods Food Management, Production & Service
Waiters & Waitresses	2208									
Fountain Workers	459									
Bartenders	2635	55						126		
		250								
Total	7414	305						126	6983	

Table 17 (continued)

Clusters Of Occupations	Manpower Needs	Manpower Supply						Private Schools	Net Manpower Needs	Clusters Of Training Programs
		Public Schools								
		Vocational - Technical				Non-Vocational Public Training Bureau of Apprenticeship, Manpower Development Training, and Bureau of Corrections				
		Secondary	Post Secondary	Adult Preparatory	Delayed Entries					
Steno/Secretary & Related	16489	288	418					113	15670	Secretary/Steno
Accounting Clerks	1051									
Bookkeepers	201									
Bank Tellers	825									
Cashiers	2215									
		20	50	140			75			Accounting & Computing
Total	4292	20	50	140			75		4007	
Office Machin Op	1969									
Keypunch Op	492									
		588		115			90	208		Office Machines & Keypunch
Total	2461	588		115			90	208	1460	
Computer Programmer	760									
Computer Op	211									
		121	113	15				1725		Data Processing
Total	971	121	113	15				1725	(1003)	
Shipping & Receiving Clerks	581								581	Material Support
Telephone Op	1161							133	1028	Communications
Personnel Workers	1344								1344	Personnel
Managers/Supervisors	9103								9103	Supervision
Other Clerical	13095	43		87			475		12490	Typing & Other Clerical N. E. C.
Civil Technician	684									
Surveyor	36									
Total	720								720	Civil Technology
Electronics Tech	163	48	75	80				540	(580)	Electronics Tech
Police, Detective, & Sheriff	1108		245						863	Police Science

Table 17 (continued)

Clusters Of Occupations	Manpower Needs	Manpower Supply							Net Manpower Needs	Clusters Of Training Programs
		Public Schools						Private Schools		
		Vocational - Technical				Non-Vocational Public Training	Bureau of Apprenticeship, Manpower Development Training, and Bureau of Corrections			
		Secondary	Post Secondary	Adult Preparatory	Delayed Entries					
Air Conditioning Mechanics	380	25		95				50	210	Air Conditioning
Appliance Repairmen	158	48	15						95	Appliance Repair
Auto Body Mechanics	154	75	15	55				138	(129)	Auto Body
Auto Mechanics	907	949	40	45				103	(230)	Auto Mechanics
Airplane Mechanics	753							177	576	Aviation Occup
Office Machine Repairmen	268								268	Business Machine Repair
Commercial Artists	62	65							(3)	Commercial Art
Photographer	103	6							97	Photography
Carpenter	828	24					5		799	Carpentry
Electrician	601	103					3		495	Electricity
Painters & Paper- hangers Plasterers	448 7									Painting & Related
Total	455								455	
Brick, Stone & Tile Setters	140						23		117	Masonry
Plumbers & Pipe Fitters	484						3		481	Plumbing
Janitors & Sextons Charwomen	2586 689									Custodial Services
Total	3275	35 35					260 260		2980	
R.R. Mechanics	64									Diesel Mechanics
Diesel Mechanics	174									
Total	238	10 10							228	
Draftsmen	539	68	93	10					368	Drafting
Linemen	828						11		817	Lineman

Table 17 (continued)

Clusters Of Occupations	Manpower Needs	Manpower Supply							Net Manpower Needs	Clusters Of Training Programs
		Public Schools					Non-Vocational Public Training Bureau of Apprenticeship, Manpower Development Training, and Bureau of Corrections	Private Schools		
		Vocational - Technical								
		Secondary	Post Secondary	Adult Preparatory	Delayed Entries					
Electronic Mechanics	127									Electronics (Voc)
Electronic Assembler	259									
Total	386	188	30	65					103	
Foremen	2073								2073	Formanship
Radio & TV Repairmen	102	13	15				75		(1)	Radio & TV
Printing Occupations	852	100	15	55					682	Graphic Arts
Welders	460	63	30	38	10		269		50	Welding
Machinists	650									Machine Shop
Machine Tool Op	1391									
Total	2041	92	3	13			132		1801	
Sheet Metal Workers	393	65							328	Sheet Metal
Cosmetologists	1466	53	15					1555	(157)	Cosmetology
Small Engine Mech	79								79	Small Engines
Cabinetmakers	64	15							49	Cabinetmaking
Truck Drivers	1643							500	1143	Truck Driving
Upholsterers	15						43		(28)	Upholstering
Excavating & Grading Machine Op	176								176	Heavy Equipment Op

force. Columns three through seven and column nine are matched against training programs while column eight is matched against occupations. Net manpower needs, demand minus supply, are listed in column ten.

DISPOSITION OF HYPOTHESIS 1

Hypothesis 1 which states "There is a significant difference between the distribution of manpower demand and manpower supply in the Kansas City SMSA" was retained on the basis of a tabular Chi Square value of 84.82 for 65 degrees of freedom at the .05 level and a computed Chi Square value of 31263.89. Table 19 presents the data used to Determine the disposition of Hypothesis 1.

DISPOSITION OF HYPOTHESIS 2

Hypothesis 2 which states "There is a significant difference between the proportion of manpower supply which is oversupply in the state of Kansas and the proportion of manpower supply which is oversupply in the Kansas City SMSA" was retained on the basis of a tabular Chi Square value of 3.84 for one degree of freedom at the .05 level and a computed Chi Square value of 7.75. Table 18 presents the data used to determine the disposition of Hypothesis 2.

Table 18

Chi Square Data for Hypothesis 2

	Kansas City SMSA	State of Kansas
Oversupply	2,334	8,614
Total Supply	20,775	71,678
N = 103,401	$\chi^2_c = 7.75$	df = 1
		$\chi^2_c = 3.84$

Table 19

Chi Square Analysis Data Table for Hypothesis 1

Clusters of Training Programs	Observed Frequency of Manpower Demand	Observed Frequency of Manpower Supply	Total Frequencies Observed in the Row	Expected Frequencies for Manpower Demand	Expected Frequencies for Manpower Supply	Chi Square Contribution for Manpower Demand	Chi Square Contribution for Manpower Supply	Total Contribution of Chi Squares for Row
Production Agriculture	128	74	202	166.52	35.47	8.91	41.85	50.76
Agriculture Mechanic	396	0	396	326.46	69.54	14.81	69.54	84.35
Horticulture	465	37	502	413.84	88.15	6.32	29.69	36.01
Ag Sales and Services and Ag Products	2346	1536	3882	3200.32	681.68	228.06	1062.80	1290.86
Ag Resources and Forestry	160	0	160	131.90	28.10	5.99	28.10	34.09
Advertising	47	44	91	75.02	15.98	10.47	48.80	59.27
Finance and Credit	39	19	58	47.82	10.18	1.63	7.57	9.20
Industrial Sales	570	19	589	485.57	103.43	14.68	68.92	83.60
Insurance Sales	590	8	598	492.99	105.01	19.09	89.62	108.71
Petroleum Sales	466	90	556	458.37	97.63	.13	.60	.73
Real Estate	158	2	160	131.90	28.10	5.16	24.24	29.40
Airline Personnel	4227	2605	6832	5632.30	1199.70	350.63	1646.13	1996.76
Apparel and Accessories								
Automobile Sales								

Table 19 (Continued)

Clusters of Training Programs	Observed Frequency of Manpower Demand	Observed Frequency of Manpower Supply	Total Frequencies Observed in the Row	Expected Frequencies for Manpower Demand	Expected Frequencies for Manpower Supply	Chi Square Contribution for Manpower Demand	Chi Square Contribution for Manpower Supply	Total Contribution of Chi Squares for Row
Floresty								
Food Distribution								
Food Services								
General Merchandise								
Hardware and Bld.								
Material Sales								
Home Furnishings Sales								
Hotel and Lodging								
International Trade Sales								
Personal Services, and Recreation and Tourism								
Dental Assistant	158	240	398	328.11	69.89	88.19	414.04	502.23
Dental Hygienist	66	0	66	54.41	11.59	2.47	11.59	14.06
Dental Lab Tech	22	0	22	18.14	3.87	.82	3.87	4.69
LPR Training	1395	1364	2759	2274.51	484.48	340.09	1596.67	1936.76
Medical Assistant	359	480	839	691.67	142.33	160.00	301.10	461.10
Medical Lab Assistant	86	0	86	70.90	15.10	3.22	15.10	18.32
Medical Record Sec.	205	150	355	292.66	62.34	26.26	123.26	149.52
Nurse Aide	2635	930	3565	2938.99	626.01	31.44	147.62	179.06

Table 19 (Continued)

Clusters of Training Programs	Observed Frequency of Manpower Demand	Observed Frequency of Manpower Supply	Total Frequencies Observed in the Row	Expected Frequencies for Manpower Demand	Expected Frequencies for Manpower Supply	Chi Square Contribution for Manpower Demand	Chi Square Contribution for Manpower Supply	Total Contribution of Chi Squares for Row
Diploma Nurse	2311	1020	3331	2746.08	584.92	68.93	121.62	392.55
Baccalaureate Nurse								
Associate Degree Nurse	829	100	929	765.87	163.13	5.20	24.43	29.63
Child Care and Guidance	1045	120	1165	960.43	204.57	7.45	34.96	42.41
Clothing Management								
Production and Services	7414	431	7845	6467.42	1377.58	138.54	650.43	788.97
Quantity Foods								
Food Management								
Production and Services								
Secretary/Steno	16489	619	17108	14103.84	3004.16	403.36	1893.70	2297.06
Accounting and Computing	4292	185	4477	3690.84	786.16	97.92	459.69	557.61
Office Machines and Key Punch	2461	1001	3462	2854.07	607.93	54.13	254.14	308.27
Data Processing	971	1974	2945	2427.86	517.14	874.20	4104.19	4978.39
Material Support	581	0	581	478.98	102.02	21.73	102.02	123.75
Communications	1161	133	1294	1066.77	227.23	8.32	39.08	47.40
Personnel Training	1344	0	1344	1107.99	236.01	50.27	236.01	286.28
Supervision and Adm. Management	9103	0	9103	7504.51	1598.49	340.48	1598.49	1938.97

Table 19 (Continued)

Clusters of Training Programs	Observed Frequency of Manpower Demand	Observed Frequency of Manpower Supply	Total Frequencies Observed in the Row	Expected Frequencies for Manpower Demand	Expected Frequencies for Manpower Supply	Chi Square Contribution for Manpower Demand	Chi Square Contribution for Manpower Supply	Total Contribution of Chi Squares for Row
Typing and Related and Other Clerical	13095	605	13700	11294.28	2405.72	287.10	1347.87	1634.97
Civil Technology	720	0	720	593.57	126.43	26.93	126.43	153.36
Electronics Tech.	163	743	906	746.91	159.09	456.48	2143.13	2599.61
Police Science	1108	245	1353	1115.41	237.59	.05	.23	.28
Air Conditioning	380	170	550	453.42	96.58	11.89	55.81	67.70
Appliance Repair	158	63	221	182.19	38.81	3.21	15.08	18.29
Body and Fender	154	283	437	360.26	76.74	118.09	554.38	672.47
Auto Mech.	907	1137	2044	1685.07	358.93	359.27	1686.66	2045.93
Aviation Mech.	753	177	930	766.69	163.31	.24	1.15	1.39
Business Machine Repair	268	0	268	220.94	47.06	10.02	47.06	57.08
Commercial Art	62	65	127	104.70	22.30	17.41	81.76	99.17
Commercial Photo	103	6	109	89.86	19.14	1.92	9.02	10.94
Carpentry	828	29	857	706.51	150.49	20.89	98.07	118.96
Electricity	601	106	707	582.85	124.15	.57	2.65	3.22
Painting and Related	455	0	455	375.10	79.90	17.02	79.90	96.92
Masonry	140	23	163	134.38	28.62	.24	1.10	1.34
Plumbing	484	3	487	401.48	85.52	16.96	79.63	96.59
Custodial Services	3275	295	3570	2943.11	626.89	37.43	175.71	213.14

Table 19 (Continued)

Clusters of Program Training	Observed Frequency of Manpower Demand	Observed Frequency of Manpower Supply	Total Frequencies Observed in the Row	Expected Frequencies for Manpower Demand	Expected Frequencies for Manpower Supply	Chi Square Contribution for Manpower Demand	Chi Square Contribution for Manpower Supply	Total Contribution of Chi Squares for Row
Diesel Mechanic	238	10	248	204.45	43.55	5.51	25.85	31.36
Drafting	539	171	710	585.32	124.68	3.67	17.21	20.88
Lineman	828	11	839	691.67	147.33	26.87	126.15	153.02
Electronics (Voc)	386	283	669	551.52	117.48	49.68	233.20	282.88
Foremanship	2073	0	2073	1708.98	364.02	77.54	364.02	441.56
Radio and TV	102	103	205	169.00	36.00	26.56	124.69	151.25
Graphic	852	170	1022	842.54	179.46	.11	.50	.61
Welding	460	410	870	717.23	152.77	92.25	433.12	525.37
Machine Shop	2041	240	2281	1880.46	400.54	13.71	64.35	78.06
Sheet Metal	393	65	458	377.58	80.42	.63	2.96	3.59
Cosmetology	1466	1623	3089	2546.57	542.43	458.51	2152.59	2611.10
Small Engine	79	0	79	65.13	13.87	2.95	13.87	16.82
Cabinemaking	64	15	79	65.13	13.87	.02	.09	.11
Truck Driving	1643	500	2143	1766.69	376.31	8.66	40.66	49.32
Upholstery	15	43	58	47.82	10.18	22.53	105.81	128.34
Heavy Equipment	176	0	176	145.09	30.91	6.58	30.91	37.49

N = 118,303

 $\chi^2 = 31,263.89$

df = 65

 $\chi^2 = 84.82$

ANALYSIS OF THE RESEARCH QUESTION

The research question presented in Chapter 16 asks "What percent of the manpower oversupply in the Kansas City SMSA is found in situations where neither state produces an oversupply for a particular occupation but the combined training for the occupation produced an excess of supply." Ten training areas showed an oversupply, i.e., dental assistant, medical assistant, computer programmer, electronics technician, auto body, auto mechanic, commercial artist, radio and TV, cosmetology and upholstery. Of these ten training areas, were auto mechanics with an oversupply of 230 workers and cosmetology with an oversupply of 157 workers. The oversupply in situations where neither state produced an oversupply by itself was 17 percent of the total oversupply. The question of coordination should probably have been asked relative to private school versus public school or even coordination between private schools. Of the 2,334 workers overproduced, 2,072 were found in training areas where private schools accounted for most of the supply. While only 11 percent of the oversupply could be alleviated through coordination among public schools in the two states, 89 percent of the oversupply could be alleviated through coordination between private schools and public schools. Table 20 presents data used to analyze the research question while a combination of Table 17 data and Table 20 data was used as a basis for remarks about private schools.

SUMMARY

The interfacing table for the Kansas City SMSA was presented with the appropriate demand or supply data entered in each column by occupation and training program cluster. The tenth column contains net manpower needs by occupation-program cluster for the 1972-1976 period inclusively.

Hypothesis 1 was retained which indicated that manpower supply and manpower demand were distributed differently relative to occupation-program clusters. The computed Chi Square value on which the hypothesis was retained was 31,263.89 as opposed to a tabular Chi Square value of 84.82 at the .05 level of significance. Table 19, page 208 shows the data used to determine the disposition of Hypothesis 1.

Analysis Data of the Manpower Oversupply
in the Kansas City SMSA

Table 20

Program Cluster	SMSA Demand	Kansas Supply	Missouri Supply	SMSA Oversupply
Auto body	154	95	198	129
Auto Mechanic	907	461	676	230
Computer Programmer	971	131	1843	1003
Commercial Artist	62	0	65	3
Cosmetology	1466	551	1072	157
Dental Assistant	158	0	240	82
Electronics Technology	163	148	599	580
Medical Assistant	359	0	480	121
Radio & TV	102	103	0	1
Upholstering	15	0	43	28

Hypothesis 2 was also retained which indicated a significant difference in the Kansas City SMSA and the proportion of supply which was oversupplied in the state of Kansas. In the Kansas City SMSA, 11 percent of the supply was in excess of the need for workers in the occupations for which students were trained while in the state of Kansas, this figure was 12 percent. The computed Chi Square value on which the hypothesis was retained was 6.44 as opposed to a tabular Chi Square value of 3.84 at the .05 level of significance.

Table 18, page 207 shows the data used to determine the disposition of Hypothesis 2.

The analysis of the research question showed that ten training areas produced an oversupply of workers. Of these ten, only two fit the situation where neither state produced an oversupply by itself. The other eight oversupply areas were caused by the student production of a single state. Private schools accounted for most of the projected oversupply of workers. The data used to analyze the research question is found in Table 20, page 214.

Chapter 20

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

It is the purpose of this chapter to present a summary of the study, conclusions and recommendations. The conclusions are based on the findings presented in Chapter 19 and the recommendations are based on the conclusions.

SUMMARY

As indicated in the 1968 Vocational Education Amendments, vocational and technical education should prepare students for actual job opportunities. This implies a need for data which projects manpower demand and supply. Although a number of manpower projection methods have been developed, many problems still exist. One such problem is to project manpower needs and supply in local labor markets which cross state boundaries. Some educational planners in the states of Kansas and Missouri recognized the need for manpower information for the Kansas City, SMSA to help implement coordinated educational planning in that area. This study developed an interfacing of manpower demand and manpower supply for the Kansas City SMSA to estimate the net manpower needs.

Two hypotheses were tested. Hypothesis 1 investigated whether or not there was a statistical discrepancy between the distributions of manpower demand and manpower supply in the Kansas City SMSA. Hypothesis 2 investigated whether or not there was a significant difference between the percent of manpower oversupply in the state of Kansas and the Kansas City SMSA. The research question considered the percent of manpower oversupply in Kansas City SMSA that is accounted for in situations where combined training produced an excess of manpower supply.

In the related literature and research it was found that the relevance of educational programs have been criticized increasingly in the past. Educational planners face the dualistic problem of combining manpower needs with student's potential and interest.

A discrepancy in American education was revealed in that a major part of the educational programs prepare students for college degrees, whereas less than twenty percent of the occupations require college education. Several noted writers emphasized the need for a change in educational planning and the need for manpower information systems. At least nine federal acts have contributed to emphasizing this planning aspect. State employment services have been unable to conduct required manpower projects to determine future manpower needs adequately. Several federally funded manpower projects to develop manpower information systems have been initiated but have not proven successful at the state level.

The need for a manpower information system for the Kansas City, Kansas and the Kansas City, Missouri area was emphasized in a proposed cooperative plan for vocational and technical education in the Ozark region.

The manpower demand data were obtained from the regional office of the Bureau of Labor Statistics in Kansas City, Missouri. The manpower supply data were obtained from Kansas State Department of Education, Missouri State Department of Education, and the private schools in Kansas City SMSA. A preliminary analysis was performed by interfacing demand and supply data to determine the net manpower needs in the Kansas City SMSA. With these data, the two hypotheses were tested using the Chi Square Test of Independence.

The interfacing table for the Kansas City SMSA was presented with the appropriate demand or supply data entered in each column by occupation and training program cluster. The tenth column contained net manpower needs by occupation-program cluster for the 1972-1976 period inclusively.

Hypothesis 1 was retained which indicated that manpower supply and manpower demand were distributed differently relative to occupation-program clusters. The computed Chi Square value on which the hypothesis was retained was 31,781.43 as opposed to a tabular Chi Square value of 85.97 at the .05 level of significance.

Hypothesis 2 was also retained which indicated a significant difference in the proportion of supply which was oversupplied in the Kansas City SMSA and the proportion of supply which was oversupplied in the state of Kansas. In the Kansas City SMSA, 11 percent of the supply was in excess of the need for workers in the occupations for which students were trained while in the

state of Kansas, this figure was 12 percent. The computed Chi Square value on which the hypothesis was retained was 7.75 as opposed to a tabular Chi Square value of 3.84 at the .05 level of significance.

The analysis of the research question showed that ten training areas produced an oversupply of workers. Of these ten, only two fit the situation where neither state produced an oversupply by itself. The other eight oversupply areas were caused by the student production of a single state. Private schools accounted for most of the projected oversupply of workers.

CONCLUSIONS

1. There is a need for vocational educators to plan the Kansas City SMSA training program mix in light of manpower demand and supply in order to decrease the discrepancy between these two factors.

2. Private schools are basing their program planning on some factors other than manpower needs.

3. There is a need for private school representatives to be included in the vocational education planning process.

4. The Kansas City SMSA does not produce enough trained workers to meet the needs of the local labor market.

5. Employment opportunities for individuals trained elsewhere will exist in the Kansas City SMSA over the next five years unless the vocational training picture changes.

6. There is no projected need for additional training programs in the following training areas: dental assistant, medical assistant, computer programmer, electronics technician, auto body, auto mechanic, commercial artist, radio and TV, cosmetology and upholstery.

7. A mobility study of vocational graduates in and out of the Kansas City SMSA would facilitate better planning.

RECOMMENDATIONS

1. It is recommended that vocational education administrators in the Kansas City SMSA form a Program Coordinating Committee which will be responsible for planning the vocational program mix on the basis of manpower demand and supply.

2. It is recommended that private schools consider manpower demand and supply in planning vocational education.

3. It is recommended that private school representatives be included on the Program Coordinating Committee.

4. It is recommended that the number of vocational education programs in the Kansas City SMSA be increased significantly in the next five years.

5. It is recommended that the vocational education planners in eastern Kansas and western Missouri consider net manpower needs in the Kansas City SMSA when planning vocational programs during the next five years.

6. It is recommended that no new vocational programs for dental assistants, medical assistants, computer programmers, electronic technicians, auto body repairmen, auto mechanics, commercial artists, radio and television repairmen, cosmetologists, and upholsterers be initiated in the Kansas City SMSA during the next five years.

7. It is recommended that a study on the mobility of vocational trainees in and out of the Kansas City SMSA be conducted.

8. It is recommended that this model be used in other labor markets which cross political boundaries.

Part 5

A PHYSICAL FACILITY UTILIZATION SURVEY
OF THE FOURTEEN AREA VOCATIONAL-
TECHNICAL SCHOOLS IN KANSAS

James C. Downs

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Chapter 21

THE PROBLEM

INTRODUCTION

Vocational education in the United States, and in each of its several states, was given a much needed rejuvenation and reemphasis by the Federal Government through the Vocational Education Amendments of 1968. This act had as its purpose:

...to authorize Federal grants to States to assist them to maintain, extend, and improve existing programs of vocational education, and to provide part-time employment for youths who need the earnings from such employment to continue their vocational training on a full-time basis, so that persons of all ages, in all communities of the State--those in high schools, those who have already entered the labor market but need to upgrade their skills or in post-secondary schools--will have ready access to vocational training or retraining which is of high quality, which is realistic in light of actual and anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training.¹

These Vocational Education Amendments of 1968 became a part of the Kansas Statutes when approved by the Legislature during its 1969 session.²

With much foresight, however, the 1963 Kansas legislature had authorized the establishment of area vocational-technical schools in Kansas.³ This area school system was originated to provide vocational training for all Kansans desiring to either prepare for entry level employment, or to gain supplementary knowledge and skills which would enable them to perform their present jobs more efficiently.

As a result, seven Kansas area vocational-technical schools started operation in 1964. These schools were located at Beloit, Coffeyville, Dodge City, Emporia, Goodland, Hutchinson-Newton-McPherson, and Topeka. The next year, area vocational-technical schools were established at Salina and Wichita. Three more area schools were begun in 1967 at Arkansas City, Atchison, and Manhattan. The two most recent additions to the area vocational-technical school system in Kansas were started at Kansas City and Liberal.⁴

These fourteen Kansas area vocational-technical schools make up the current Kansas area school system. See Figure 7, page 225, for school names and locations.

Today, the Kansas area schools are of two types. The two types differ with respect to the manner in which they are governed and funded. The first type, known as area vocational-technical schools, has as its governing body a board of control constituted of members from the participating Unified School Districts. The funding for these schools comes from the same participating districts. The area schools to which this definition applies are:

1. Central Kansas Area Vocational-Technical School headquartered at Newton;
2. North Central Area Vocational-Technical School at Beloit;
3. Northwest Kansas Area Vocational-Technical School at Goodland;
4. Southeast Kansas Area Vocational-Technical School at Coffeyville.⁵

The second type, known as Kansas area vocational schools, refers to:

...any vocational education school approved by the state board of education of a school district, or a board of trustees of a community junior college, or as part of an institution under the state board of regents, or the board of regents of a municipal university.⁶

The funding source for these schools is that school district, community junior college, or board of regents which governs it.

The preceding definitions for area school types are those specified by law. Kansas educators and citizens, however, commonly refer to both of these area school types as area vocational-technical schools, which will be the term used to refer to all fourteen such schools in Kansas throughout the remainder of this paper. Abbreviated forms of this term also popularly used in Kansas include "area schools, area vocational schools, AVTS's and vo-tech schools."

Originally, the State Board for Vocational Education authorized the development of twenty area schools.⁷ However, due to limited resources, socio-political influences and the growth of the Kansas Public Junior College System, only fourteen schools have been established. Administrators of these schools claim that because of limited facilities they cannot accept the large number of applicants who request vocational training and as a result, annually turn away a significant number of Kansans needing training.

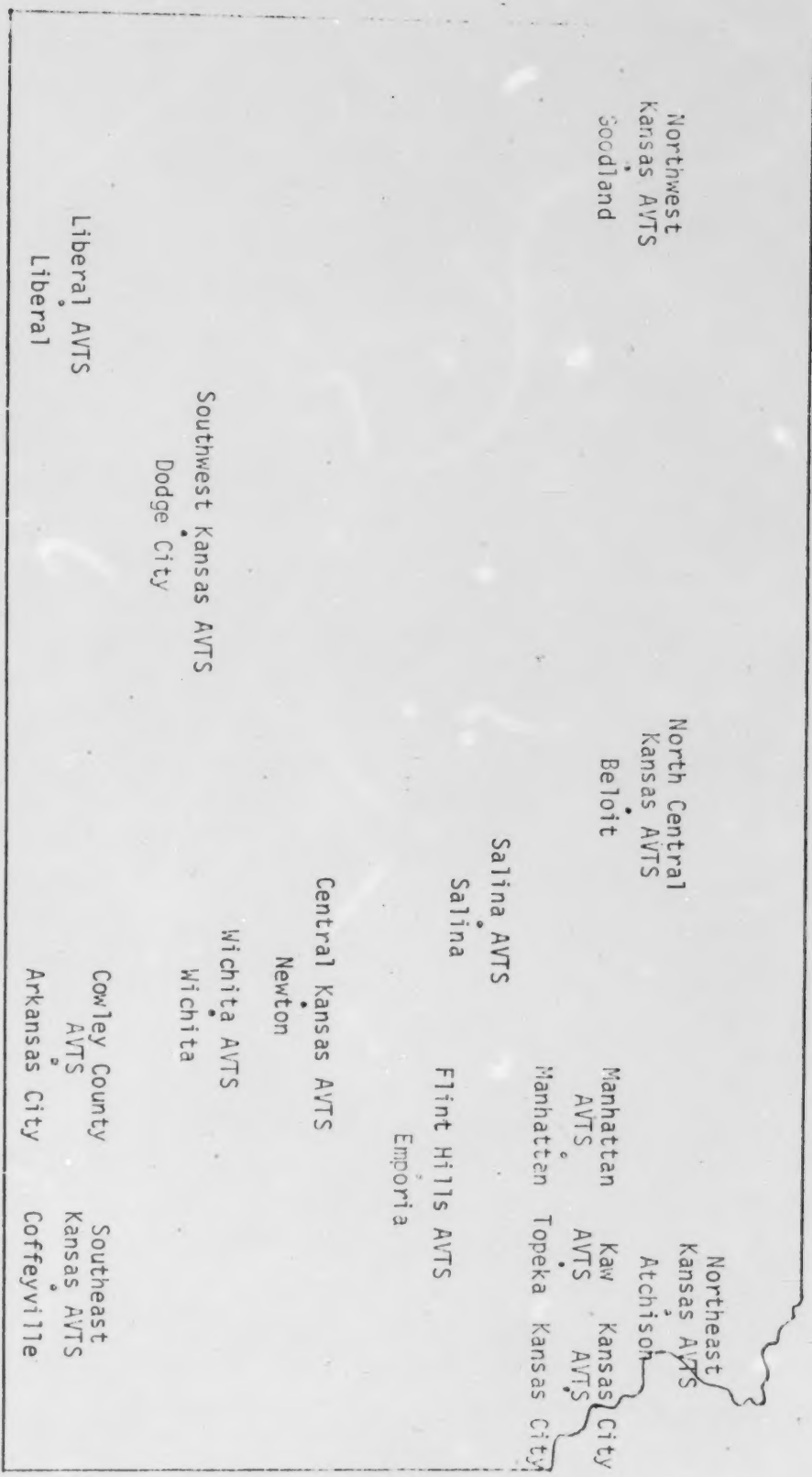


Figure 7
The Area Vocational-Technical School System
in Kansas by School and Location

If, in fact, applicants are being refused training, then one of two situations probably exists. Either the schools are not using their facilities in a manner that would maximize services, or the facilities available are not adequate to meet training needs.

In summary, either the area schools are presently providing adequate amounts and types of training for Kansans, or they are not. If they are not, either facilities are adequate but misused, or the facilities are not adequate. This study investigates the present situation relative to Kansas area vocational-technical school physical facility usage.

NEED FOR THE STUDY

The Division of Vocational Education of the Kansas Department of Education has indicated a willingness to allocate funds for physical facilities in the fourteen area schools if a sufficient need can be demonstrated. In addition to proving the need, area school directors must also provide justification for the number of dollars requested. In an effort to compile data pertaining to the need for new area vocational-technical school physical facilities, the directors of the fourteen Kansas area schools have requested that an investigation be conducted of the current area school facility status.

STATEMENT OF THE PROBLEM

This study attempted to answer the question, "Is there justification for additional state expenditures for the renovation and/or construction of physical facilities at the fourteen area vocational-technical schools in Kansas?"

HYPOTHESES TO BE TESTED

The following hypotheses will be statistically tested in this study. The questions preceding each hypothesis have been included to further explain the rationale for the sequence of hypotheses. This format should enable a Kansas Department of Education vocational administrator to make a more knowledgeable decision concerning the allocation of funds for area vocational-

technical school physical facility expansion. Figure 8 presents a logical framework, or setting, for the hypothesis tested. The hypotheses are stated in terms of logically anticipated outcomes rather than in the traditional null hypothesis format.

Question 1

Is student capacity in the different Kansas area vocational-technical schools directly related to the size of physical facilities?

Hypothesis 1

There is a high positive correlation between the total square footage of physical facilities and the student capacity at the fourteen area vocational-technical schools in Kansas.

Question 2

Given that certain vocational programs have greater student interest than others, do the Kansas area vocational-technical schools utilize their physical facilities for high demand programs to a greater extent than they use the physical facilities for other programs?

Hypothesis 2

There is a high positive correlation between program facility utilization and the number of students who request admittance to a program but cannot be served (overflow) at the fourteen Kansas area vocational-technical schools.

Question 3

Would an increased utilization rate of physical facilities (crowding) affect the placement rate of graduates from the Kansas area vocational-technical schools?

Hypothesis 3

There is a negative correlation between program physical facility utilization and the program placement rates of graduates from the Kansas area vocational-technical schools.

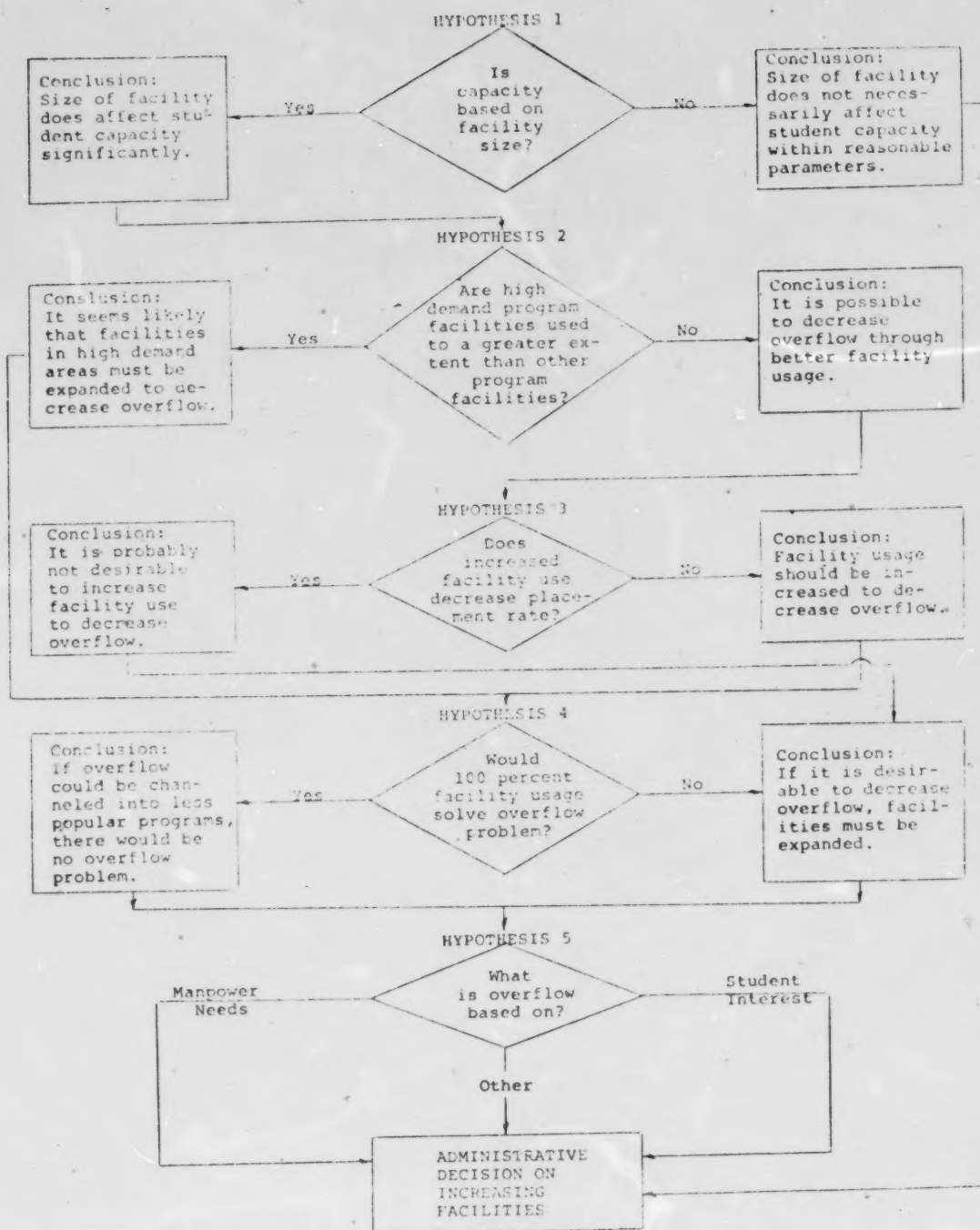


Figure 8

The Decision-Making Process for Funding Kansas Area Vocational-Technical School Physical Facility Expansion

Question 4

Would 100 percent physical facility utilization eliminate the necessity of refusing training to applicants who cannot presently be served by the Kansas area vocational-technical schools?

Hypothesis 4

There is no significant difference between 100 percent student capacity of physical facilities and total potential student applications to programs at the Kansas area vocational-technical schools.

Question 5

Upon what factors, other than student overflow, are the requests for funds for physical facility expansion at the Kansas area vocational-technical schools based?

Hypothesis 5-A

There is a high positive correlation between manpower needs relative to potential training programs and the funds requested for program physical facility expansion at the Kansas area vocational-technical schools.

Hypothesis 5-B

There is a high positive correlation between student interest in particular programs and the funds requested for program physical facility expansion at the Kansas area vocational-technical schools.

ASSUMPTIONS

The assumptions on which this study was based include:

1. Although questionnaires and requests for information were delivered to area school directors, program instructors actually completed the forms.
2. Area school instructors have similar frames of reference upon which to draw and will answer the questionnaire in like manner, especially the section on status of condition of present facilities.
3. Area school instructors and directors are in agreement on projected physical facility renovation or expansion at their schools.

4. A major goal of all Kansas area school programs is to place graduates in jobs for which they were trained or closely related to that training.

5. The area vocational-technical schools have the greatest potential for providing job entry level and skill upgrading training of any institutions in Kansas.

LIMITATIONS

This study was subject to the following limitations:

1. The study was restricted to 1972 data from the fourteen area vocational-technical schools in Kansas.

2. The findings of this study are limited in validity to the area school administrators interpretation of the information requested on the survey instrument.

3. The projected expansion and renovation of area vocational-technical school facilities are limited to the area school administrator's awareness and insight into the changing vocational needs of Kansas.

4. The results, implications and recommendations of the study are relevant to Kansas area schools only.

SUMMARY

At the request of the directors of the fourteen area vocational-technical schools in Kansas and the vocational administrators at the Kansas Department of Education, this study is being undertaken. A brief history of the Kansas area vocational-technical school system is included.

The Kansas area schools are also described as being of two types for the purposes of administration and funding. Each school is identified by type and by geographic location.

The problem to be answered in this study was whether or not the allocation of additional state funds for physical facility expansion could be justified on the basis of an examination of current area vocational-technical school physical facility use. A flow chart depicting a logical presentation of the hypotheses to be tested has been developed.

The hypotheses were then presented in a unique format which first asks a question and then attempts to provide the answer through the statement of an associated hypothesis.

The chapter concludes with a list of assumptions and a list of limitations for the study.

FOOTNOTES

¹U.S., Statutes at Large, 90th Congress, 2d Session (1968), Vol. 82 (Washington: Government Printing Office), p. 1064.

²Kansas, Statutes Annotated, Volume 5A, Chapter 72, Article 44, Paragraph 4409 (Topeka: Kansas State Printer, 1972), p. 143.

³"Kansas Area Vocational-Technical Schools, A Brief History," (Mimeographed memorandum by the Salina Area Vocational-Technical School, 1971, Salina, Kansas).

⁴Ibid.

⁵Kansas, Statutes Annotated, loc. cit.

⁶Ibid.

⁷A mimeographed "Statement of General Policies and Principles," (Pertaining to the establishment of Kansas area vocational-technical schools under the provisions of Senate Bill No. 438). Obtained from John Snyder, Assistant Commissioner, Division of Vocational Education, Kansas Department of Education.

Chapter 22

DEFINITIONS AND REVIEW OF LITERATURE

INTRODUCTION

The purpose of this chapter is to define the terminology pertinent to the understanding and use of major concepts found in this study, and to examine and summarize prior works related to the purpose of this investigation.

DEFINITIONS

The following definitions apply to the program types and other terminology unique to this investigation.

Accounting

Planned learning experiences which include a combination of courses and practical experiences concerned with systematizing information about transactions and activities into accounts and quantitative records, and paying and receiving money.¹

Agribusiness Technology

A combination of subject matter and learning experiences designed to teach basic principles and management decisions involved in the science and technology of farm products, including marketing, inspection and processing.²

Agricultural Production

Subject matter and learning activities which are concerned with the principles and processes involved in the planning related to and the economic use of facilities, land, water, machinery, chemicals, finance, and labor in the production of plant and animal products. Activities include classroom instruction and laboratory experiences in and out of school, including farms, ranches and other agriculturally related establishments.³

Agricultural Science

The study of a variety of chemicals, drugs, and related products which are associated with the production of animals and plant products. Usually included for study are various types of chemicals used to prevent, control, or cure animal and plant diseases and to control pests.⁴

Agriculture-Cooperative Training

A combination program of agricultural study and practice--conducted on an altering schedule of half days, days, weeks, or other periods of time--providing legal employment for pupils with organized on-the-job training and correlated school instruction.⁵

Agriculture-Vocational

A program of study intended to train students for future employment in occupations related to agricultural production.

Air Conditioning and Refrigeration

Classroom and shop experience concerned with commercial chilling and freezing systems, including theory, application, and operating of compressors, expansion and float valves, thermostats, and pressure controls; diagnosing, overhauling, and testings methods and procedures; charging and discharging systems with refrigerants; and testing hermetic units, relays, and overload devices.⁶

Aircraft Maintenance

Classroom and shop experiences concerned with the inspection, repair, servicing, and overhauling of all airplane parts including engines, propellers, instruments, airframes, fuel and oil tanks, control cables, and hydraulic units. Learning the use of technical manuals and various kinds of testing equipment is also emphasized.⁷

Appliance Repair

Classroom and shop experiences concerned with the theory of electrical circuitry, simple glaring, linkages, and lubrication in the operation, maintenance, and repair of components including relays, time switches, pumps, and

agitators used in appliances such as washers, dryers, vacuum cleaners, toasters, water heaters, and stoves. Related training is provided in the uses of familiar tools, test equipment, and service manuals, and in making cost estimates for repair.⁸

Area School System

A Kansas system of area vocational-technical schools. The fourteen area vocational-technical schools in Kansas.

Area Vocational School

Any vocational education school which is organized and approved by the state board and is operated under an elected board of education of a school district, or a board of trustees of a community junior college, or as a part of an institution under the state board of regents or the board of regents of a municipal university.⁹

Area Vocational- Technical School

Any vocational education school, the governing body of which is elected from among candidates from those districts participating in and acting as the financial base for funding purposes.¹⁰

Auto Body Repair

Specialized learning experiences concerned with all phases of repairing damaged bodies and fenders including metal straightening by hammering, smoothing areas by filing, grinding or sanding, concealment of imperfections, painting, and replacement of body components, including trim.¹¹

Auto Mechanics

Learning experiences concerned with the components of the vehicle, including engine, power transmission, steering, brakes, and electrical systems. Included is training in the use of diagnostic and testing equipment and tools used in the repair process.¹²

Bricklaying

Specialized classroom and shop experiences concerned with the cutting, chipping, and fixing in position of concrete blocks, brick, and glass blocks

using bonding materials and hand tools. Included is training in reading architectural plans, planning and estimating.¹³

Business Education

Learning experiences of a very basic or general nature related to the field of business. Included are the basic skill areas of bookkeeping, shorthand, and typewriting.

Carpentry

Classroom and shop experiences involving layout, fabrication, assembly, installation, and repair of structural units. Emphasized in instruction are the care and use of hand and power tools; equipment and materials; common systems of frame construction and the principles involved; and drafting, blueprint reading, applied mathematics, and materials estimating.¹⁴

Certified Laboratory Assistant

A combination of subject matter and experience designed to prepare a person to work under the supervision of medical technologists, clinical pathologists, or physicians to perform routine clinical laboratory procedures.¹⁵

Child Day Care

Preparation for various kinds of employment related to child care centers and young children, e.g., assisting directors of child day care centers, or nursery schools, assisting with activities on playgrounds and in recreation centers, and caring for children in homes and in such public places as stores, playgrounds, recreation centers, and transportation terminals.¹⁶

Civil Technology

A planned program of classroom and laboratory experiences including the study of physical sciences, mathematics, surveying, strength of materials, and other specialty courses leading to preparation for designing, testing, and supervising the construction of highways, railroads, airports, bridges, harbors, irrigation works, sanitary plants, and other structures. The graduate works in direct support of the civil engineer.¹⁷

Clothing

The study of clothing and textiles, including the significance of these to the individual and family, and the nature, acquisition, and uses of textiles and clothing products. Planned experiences in the selection, construction, maintenance, and alteration of clothing and other textiles products are usually provided.¹⁸

Commercial Art

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to the design and execution of layouts and making illustrations for advertising, display, and instructional manuals. Instruction includes advertising theory and preparation of copy, lettering, poster design, fashion illustration, silk screen, air brush and touchup, inks and color dynamics, package and product design, drawings for line and halftone reproduction, and other display devices and exhibits.¹⁹

Communications Technology

Specialized classroom and practical experiences concerned with the assembly, installation, operation, maintenance, and repair of communications equipment and systems of all types, e.g., industrial and entertainment sound systems, data processing, telephone dial systems, two-way radio, central circuits, hearing aids, and high-fidelity receiving sets.²⁰

Cooperative Fashion Merchandising

Preparation for employment concerned with clothing and textiles, such as fitting and altering ready-made garments, custom tailoring and dressmaking, laundry-drycleaning work, demonstration work, and technical work in business and industry.²¹

Cooperative Industrial Training

An activity in which pupils in occupational programs of study spend a portion of their time in supervised employment (on-the-job training) in business or industry.²²

Cosmetology

Classroom and practical experiences concerned with a variety of

beauty treatments, including the care and beautification of the hair, complexion, and hands. Instruction includes training in giving shampoos, rinses, and scalp treatments; hair styling, setting, cutting, dyeing, tinting, and bleaching; permanent waving; facials; and manicuring and hand and arm massaging. Bacteriology, anatomy, hygiene, sanitation, salon management (including keeping records), and customer relations are also emphasized. Instruction is designed to qualify pupils for the licensing examination.²³

Cycle, Marine, and Small Engine Repair

Classroom and shop experiences concerned with maintaining and repairing a variety of small engines used on portable power equipment, such as lawnmowers, outboard motorboats, chain saws, and rototillers. Instruction includes principles of internal-combustion engine operation, reading technical manuals, and customer relations.²⁴

Data Processing

Planned learning activities which include a combination of courses and practical experiences concerned with business data processing systems and operations.²⁵

Dental Assistant

A combination of subject matter and experiences designed to prepare a person to assist the dentist at the chairside in the dental operatory, to perform reception and clerical functions, and to carry out selected dental laboratory work.²⁶

Dental Hygienist

A combination of subject matter and experiences designed to prepare a person to provide services to patients such as performing complete oral prophylaxis, applying medication, and providing dental health education services, both for chairside patients and in community health programs, under the supervision of the dentist.²⁷

Diesel Mechanic

Classroom and shop experiences which are concerned with all phases

of repair work on diesel engines used to power buses, ships, trucks, railroad trains, electric generators, construction machinery, and similar equipment. Instruction and practice are provided in the diagnosis of malfunction; disassembly of engines and examination of parts; reconditioning and replacement of parts; repair and adjustment of fuel injection systems, oil and water pumps, generators, governors, auxiliary and accompanying power units, controls, and transmissions. The uses of technical manuals, a variety of hand and power tools, and testing and diagnostic equipment are also studied.²⁸

Distributive Education

Comprised of programs of occupational instruction in the field of distribution and marketing. This includes various combinations of subject matter and learning experiences related to the performance of activities that direct the flow of goods and services, including their appropriate utilization, from the producer to the consumer or user. These activities include selling, and such sales-supporting functions as buying, transporting, storing, promoting, financing, marketing research and management.²⁹

Drafting

Organized specialized learning experiences which emphasize theory, use of the drafting room, and laboratory and shopwork as each relates to gathering and translating data or specifications, including the aspects of planning, preparing, and interpreting mechanical, architectural, structural, pneumatic, marine, electrical/electronic, topographical, and other drawings and sketches. Instruction is designed to provide experiences in drawing; in the use of reproduction materials, equipment, and processes; the preparation of reports and data sheets for writing specifications; the development of plan and process charts and drawings; and the development of models. Instruction emphasizes the development of skills and knowledge essential for employment in related capacities.³⁰

Electricity

Classroom and shop experiences concerned with the layout, assembly, installation, testing, and maintenance of electrical fixtures, apparatus, and wiring used in electrical systems. Instruction is provided in the

reading, interpretation, and understanding of residential, commercial, and industrial wiring based on existing electrical codes.³¹

Electronics

Organized specialized learning experiences which include theory, laboratory, and shopwork as each relates to planning, producing, testing, assembling, and installing maintaining electronic communications equipment; and control devices. Emphasis is on solid-state devices and components, electron tube characteristics, low-frequency amplifiers, LC and RC oscillators, transistors, and amplitude and frequency modulation. Instruction is designed to develop knowledge, understanding, and skills essential for employment in communications, industrial electronics, radio-television, and other electronics occupations.³²

Engineering Technology

That part of the engineering field which requires the application of scientific and engineering knowledge and methods combined with technical skills necessary in the support of engineering activities. Persons prepared in this technology are a part of the engineering manpower team which includes the skilled craftsman, the technician, and the engineer, and work as technicians in close support of the engineer.³³

Environmental Water Control

A combination of subject matter and practical experiences designed to develop knowledge and skills concerned with surveying, planning, laying out, constructing, using, and maintaining irrigation, drainage, water conservation, runoff, and erosion control systems, and with maintaining proper soil-water-plant relationships.³⁴

Facilities Use Rate

See the definition for Physical Facility Utilization Rate.

Farm Mechanics

A combination of subject matter and activities designed to develop abilities necessary for assisting with and/or performing the common and important operations or processes concerned with the selection, operation,

maintenance and use of agricultural power, agricultural machinery and agricultural mechanics shop, including kindred sales and services.³⁵

Farm and Ranch Management

Planned learning activities which are concerned with farm resource analysis, accounting, production, financing, resource acquisition, purchasing, farm inputs, performance records, contracts, farm marketing and maintenance. The results of these learning activities are applied to formulating decisions involved in managing a farm or ranch operation.³⁶

Fluid Power Mechanics

The study of hydraulics and pneumatics, including power conversion, transmission, and utilization in both stationary and mobile installations.³⁷

Foods

Organized subject matter and learning experiences related to the sales and sales-supporting tasks performed by distributive employees and management personnel in establishments serving prepared foods and drinks for consumption on their own premises or at a place designated by the customer.³⁸

Heavy Equipment

Classroom and practical work experiences concerned with the operation, maintenance, and repair of heavy-duty equipment such as bulldozers, cranes, graders, tractors, concrete mixers, crawler-mounted shovels, trailer-mounted compressors, and the gasoline or diesel engines powering the equipment.³⁹

Home Economics

The group of related courses or units of instruction organized for purposes of enabling pupils to acquire knowledge and develop understanding, attitudes, and skills relevant to (a) personal, home, and family life, and (b) occupational preparation using the knowledge and skills of home economics.⁴⁰

Horticulture

Organized subject matter and practical experiences concerned with the culture of plants used principally for ornamental or esthetic purposes. Instruction emphasizes knowledge and understanding important to establishing, maintaining, and managing ornamental horticulture enterprises.⁴¹

Industrial Plastics

Classroom and shop experiences dealing with plastics and their characteristics, and with bench molding, fitting, internal carving, and finishing plastics and fiberglass materials into products. Instruction includes using hand and power tools.⁴²

Instrumentation Technology

A sequence of classroom and laboratory experiences, supported by physical sciences and mathematics, concerned with providing an understanding in the fields of electricity, electronics, mechanics, pneumatics, and hydraulics as they pertain to applications of the principles of control and recording systems and automated devices. The instructional program is planned to prepare the pupil to design, develop prototypes, and test and evaluate control systems or automated systems and to prepare graphs, written reports and test results in support of the professional personnel working in the field of instrumentation.⁴³

Job Placement Rate

The percentage of successful graduates from the fourteen Kansas area vocational-technical schools who, upon graduation from a bonified program, found employment in a job related to their training.

Licenses Practical Nurse

A combination of subject matter and supervised clinical experiences designed to prepare a person to give direct nursing care under the supervision of a nurse or physician.⁴⁴

Machine Shop

Specialized classroom and shop experiences concerned with all aspects of shaping metal parts. Instruction involves making computations relating to work dimensions, tooling, feeds, and speeds of machining. Also emphasized are work on the bench, and on lathes, shapers, milling machines, grinders and drills, the uses of precision measuring instruments such as layout tools, micrometers, and gages; methods of machining and heat treatment of various metals; blueprint reading; and the layout of machine parts. Instruction prepared the pupil to operate and repair all machines.⁴⁵

Marketing

Organized subject matter and learning experiences related to a variety of sales and sales-supporting tasks performed by distributive employees and management personnel engaged primarily in selling various types of merchandise at retail in department stores, junior department stores, variety stores, general merchandise stores, discount stores, and catalog houses.⁴⁶

Medical Assistant

A combination of subject matter and experiences designed to prepare a person to perform functions and follow procedures concerned with diagnosis and treatment of patients in a physician's office. Instruction includes physical examinations, laboratory tests, x-rays, measurements, and medications.⁴⁷

Medical Secretary

Programs related to occupations concerned with carrying out administrative and general medical office duties, in addition to taking and transcribing dictation.⁴⁸

Metal Fabrication

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to the planning, manufacturing, assembling, testing, and repairing of parts, mechanisms, machines, and structures in which materials are cast, formed, shaped, molded, heat treated, cut, twisted, bent, pressed, stamped, fused, marked, or otherwise worked upon. Instruction emphasizes knowledge, skills, and understandings which lead to preparation for various types of skilled and semiskilled employment as well as helper-type jobs.⁴⁹

Millwork and Cabinetmaking

Specialized classes and practical work experiences concerned with mass production of products such as window frames, moldings, trim, and panels; and with making such products as furniture, store fixtures, kitchen cabinets, and office equipment. Instruction includes training in cutting, shaping, and assembling parts by means of handtools and woodworking machines;

refinishing furniture; installing hardware, such as hinges, catches, and drawer pulls; planning layouts; blueprint reading; drafting; and features of various kinds of woods.⁵⁰

Monies Requested

Financial requests submitted to the Division of Vocational Education, Kansas State Department of Education, for physical facility expansion and renovation by administrators at the fourteen area vocational-technical schools in Kansas.

Office Education

This body of subject matter, or combination of courses and practical experience, is organized into programs of instruction to provide opportunities for students to prepare for or advance in selected office occupations. Learning experiences are designed to lead to employment and/or advancement of individuals in occupations of public or private enterprise or organizations related to the facilitation function of the office.⁵¹

Office Machines

Programs concerned with operations and procedures utilizing office machines for billing, posting, calculating, adding, listing, and mechanizing data.⁵²

Overflow

See the definition for Student Overflow.

Photography

Organized specialized learning experiences which include theory, laboratory, and studio work as each relates to all phases of camera uses and photographic processing. Instruction includes composition and color dynamics, contract printing, and enlarging; developing film; air brush and cameras, meters and other photographic equipment; portrait, commercial, and industrial photography; and processes such as microfilming and preparing copy for other printing and graphic arts processing.⁵³

Physical Facilities

The educational physical plant of any of the fourteen Kansas area vocational-technical schools, regardless of whether the buildings are owned, rented, leased, or borrowed.

Physical Facility Utilization Rate

A rate expressed as a percentage that identifies the use being made of current physical facilities for programs at the fourteen area vocational-technical schools in Kansas. This rate expresses a comparison of actual use of the facilities and the potential full capacity use of the facilities as identified by area vocational-technical school directors. A more detailed explanation of the computation of this rate appears in Chapter 3.

Police Science

A planned sequence of classroom instruction and laboratory experiences designed to prepare a student to function as one or more of the following:

- (1) a generalist in any law enforcement agency concerned with patrol and investigative activities, traffic control, initial contact with the public such as obtaining information, preparing reports, and testifying in court;
- (2) an evidence technician operating in a crime laboratory or mobile unit concerned with the collection preparation, and transportation of physical evidence--including the use of skills in photography and report writing; and
- (3) a technician--primarily concerned with delinquency or crime prevention--who may be employed by a police agency, juvenile court, or correctional institution to (a) carry out responsibilities which may include investigation and referral of dependent-neglected children as well as delinquents and youthful offenders, (b) supervise persons on probation, or (c) provide rehabilitative services to offenders.⁵⁴

Power Mechanics

Specialized classroom and shop experiences concerned with the maintenance and repair of all types of power plants for aircraft. Course work includes engine inspection and maintenance; lubrication and cooling; electrical and ignition systems; carburetion, fuels and fuel systems; and propellers. Training prepares the student for the Federal Aviation Administration examination for the power plant mechanics license.⁵⁵

Printing

Organized, specialized learning experiences which include theory laboratory, and shopwork as they relate to all phases of hot and cold type-

setting, layout, composition, presswork, and binding, including flexography, lithography, photoengraving, and other graphic arts related to the printing industry. Emphasis is on typographical layouts and design, hand and machine typesetting, camera and plate work, imposition, typesetting, offset and platen press makeup and operation, papercutting, ink and color preparation, binding, and production by silk screen process.⁵⁶

Program

The uniqueness of a course of occupational study at a specific school; for example, all classes offered at any Kansas area vocational-technical school for the training of welders.

Program Type

Occupational training generalized to describe similar programs of study at all schools used in this study; for example, the welding programs at all the Kansas area vocational-technical schools.

Radio-Television

Specialized theory and practice which are concerned with the construction, maintenance, and repair of radios and television sets. Training also prepares students to diagnose troubles and make repairs on other electronic products such as high-fidelity sound equipment, phonographs, and tape recorders.⁵⁷

Restaurant Management

Preparation for various kinds of employment related to institutional and commercial food services. Employment may include workers and supervisors in hospitals, day care centers, homes for the elderly, and school lunch programs, and demonstrators and technicians in food industries.⁵⁸

Secretarial

Programs related to occupations concerned with carrying out administrative and general office duties, in addition to taking and transcribing dictation.⁵⁹

Special Trade and Industrial

Included here is other organized subject matter and learning

experiences emphasized in trade and industrial occupations, but not listed or categorized as a separate major instructional program.⁶⁰

Student Capacity

The total number of students which can reasonably be trained in the normal duration of an educational training period for any program in the fourteen Kansas area vocational-technical schools.

Student Overflow

The number of student applicants to programs at the fourteen Kansas area vocational-technical schools who were not admitted because of a lack of physical facility space.

Total Square Footage

The total number of square feet of classroom and laboratory space utilized by a program at any of the fourteen Kansas area vocational-technical schools.

Truck Driving

A term applied to a worker who: (1) may drive trucks to transport materials, merchandise, equipment, or men, (2) loads and unloads trucks by hand, or by use of mechanical devices, such as hoists, pumps, lifts, or winches, (3) may lubricate truck or make minor repairs.⁶¹

Vocational Education

Vocational or technical training or retraining which is given in schools or classes under public supervision and control or under contract with the state board. This education is conducted to prepare individuals for gainful employment as semi-skilled or skilled workers or technicians or subprofessionals in recognized occupations and in new and emerging occupations or to prepare individuals for enrollment in advanced technical education programs.⁶²

Welding

Specialized classroom and shop experiences concerned with all types of metal welding, brazing, and flame cutting. Instruction emphasizes properties of metals, blueprint reading, electrical principles, welding symbols, and mechanical drawing.⁶³

WHY VOCATIONAL EDUCATION PROGRAMS ARE NEEDED

Since only 15 to 18 percent of all young people who begin school complete their education with a college bachelor's degree, America's public schools must provide occupational training for at least 85 percent of their school populations.⁶⁴ According to Larsen and Blake,⁶⁵ the United States had 4,500,000 vocational-technical students in 1964, 7,500,000 vocational-technical students in 1968, and by 1975 they estimated that there would be 14,000,000 potential vocational-technical students. At the current rates of construction, there will be a shortage of 1,723,340 vocational-technical student work stations. This would mean that only 20 percent of the increased need is being met.⁶⁶

According to Russo,⁶⁷ the only vocational education facilities for which Congress is willing to appropriate construction funds are the area vocational-technical schools. Russo also has compiled several educational trends he feels are inevitable. These trends must be considered in answering the demands which will be placed on vocational education during the next few years. Vocational education must:

1. Increase class sizes.
2. Utilize different (rather than traditional) time frames.
3. Make additional provisions for individual differences.
4. Use physical facilities 24 hours a day, 12 months a year.
5. Use multiple staffing.
6. Sensibly cluster occupational training.
7. Work more closely with labor and industry.
8. Expand cooperative education programs.
9. Restructure curricula to enable students to develop as far as he is able to as far as he wishes.
10. Work more closely with academic areas.
11. Help the vocational student relate to academic subjects.⁶⁸

If a community desires to build vocational education facilities, it should first survey its local area for program and building needs.⁶⁹ It is even possible to adopt methods from business and industry to provide facilities that are flexible and adaptable to changing conditions.⁷⁰

SOME VARYING APPROACHES TO EDUCATIONAL FACILITY CONSTRUCTION

Frederickson⁷¹ advocates the use of comparisons of educational facilities recently constructed to those needed in the immediate locale as a good method of approximating construction costs. The three most common comparisons are: (1) cost per square foot, (2) cost per student, and (3) cost per classroom. Of these three approaches, Frederickson⁷² stresses the use of cost per square foot as being the most meaningful when considered along with the durability, the functionality, and the adaptability of the construction.

Factors which must be considered in addition to the cost per square foot are:

1. Type of school.
2. New building or addition.
3. Number of stories.
4. Total floor space.
5. Number and type of rooms.
6. Construction dates.
7. Geographic cost area.
8. Enrollment capacity.⁷³

Another approach to vocational physical facility acquisition is the appraisal of abandoned industrial buildings as possible educational plants. This technique is most appropriate for large metropolitan areas where land and construction costs are quite high. In Chicago an abandoned milking machine factory has been converted to a vocational-technical school in which Western Electric and Motorola have established shops to aid in the training of students and to manufacture their component parts.⁷⁴ In Toledo, an old post office building has been converted into a vocational rehabilitation center.⁷⁵

Chase⁷⁶ advocates the use of the "Educational Facilities Charette" as a technique for studying and resolving problems connected with educational facility development. This technique gives primary emphasis to educational facility and program planning as a catalyst for community revitalization. To be effective, the charette must be comprised of a multidisciplinary group,

from all jobs and backgrounds, of residents and leaders in the community.⁷⁷

Strevel⁷⁸ recommends the survey technique to determine educational facility needs, stressing the following guidelines. The pressing demands of a vocational survey include:

1. Must serve total community.
2. Be alert to changing occupations which make some skills obsolete and creates markets for others.
3. Vocational educators must gain more respect for the academic program.
4. Vocational counseling must improve.
5. Vocational education requires a variety of laboratories.⁷⁹

KANSAS VOCATIONAL EDUCATION REIMBURSEMENT TO LOCAL PROGRAMS

The following reimbursement policy for funding all Kansas vocational education programs, more commonly called the weighted systems approach, was implemented in 1970.

The five factors used to evaluate applications for vocational education programs by this technique and their accompanying weights are:

1. Manpower needs and job opportunities, Weight: 7;
2. Vocational education needs of students, Weight: 4;
3. Local district's relative ability to provide resources, Weight: 3;
4. Excessive geographical costs, Weight: 2;
5. Additional considerations;
 - a. Economically depressed areas, Weight: 5;
 - b. High dropout or youth unemployment areas, Weight: 5;
 - c. Program evaluation, Weight: 10.⁸⁰

Each of these factors is evaluated on a scale of one to five, with five being the highest priority. The scale value assigned to a factor is then multiplied by the weight for that factor to determine the total value that factor adds to the application. The total values for all five factors are then summed to determine, from a possible total of 100 points, the priority which will be given to a local program application.⁸¹

The determination of the amount of assistance a local program will receive from the Division of Vocational Education is achieved through the process in the following example. If the total points for applications by a particular program type are summed and equal 8,000, and the money available for reimbursement is \$400,000, then a program with a total point value of 85 would get \$4,250 as follows:⁸²

$$\frac{85}{8,000} \times \$400,000 = \$4,250$$

KANSAS FUNDING FOR AREA VOCATIONAL TECHNICAL SCHOOL PROGRAMS

Applications for state funds for programs in the fourteen area vocational-technical schools in Kansas are evaluated by the Division of Vocational Education in the same manner previously mentioned for vocational education programs in general, but are also given special consideration because of their limited financial resources. In addition to program reimbursement monies, the area vocational-technical schools also receive funds to defray administrative costs, counseling, and other ancillary services. The current reimbursement to Kansas area vocational-technical schools averages 45 percent of operating costs, however, this figure varies with the funds available.⁸³

The adequacy of vocational facilities in Kansas is also evaluated by the Division of Vocational Education in relation to current program needs such as the size of student enrollment, the provisions made for varied teacher learning experiences, and the plans for expansion and replacement.⁸⁴

KANSAS VOCATIONAL EDUCATION FUNDING FOR PHYSICAL FACILITY CONSTRUCTION

The Vocational Education Act of 1963 and its accompanying Amendments of 1968 authorize the use of Federal funds for the construction of area vocational education school facilities. Two basic concepts in support of this philosophy are advocated by Johnson.⁸⁵ These include: (1) in order to accommodate the wide range of activities in the vocational education

curriculum, flexibility of space, equipment and utilities is essential; and (2) there is a need for the adaptability of facilities to meet the evolving demands of technology.

In Kansas, the Division of Vocational Education assists local districts in the construction and renovation of vocational facilities as funds are available. Kansas law, however, prohibits the use of state funds for the construction of local educational facilities.⁸⁶ Therefore, funds for vocational education facility construction are usually 50 percent Federal and 50 percent local.

Through 1970, all vocational education funds for construction received by Kansas from Federal sources have been used entirely for construction at the Kansas area vocational-technical schools. No vocational education monies were made available for construction in 1970 due to insufficient funds.⁸⁷

Local Kansas school districts submit applications for construction assistance, and funds are allotted on a project basis after the need is evaluated. All construction projects which involve Federal funds must comply with Federal labor and equal opportunity standards, and with Kansas law which requires competitive bidding on the construction of public buildings.⁸⁸

During 1971, the Division of Vocational Education approved a total of \$506,875 to be spent on area vocational-technical school physical facility construction of which \$253,437 was Federal money, and \$253,438 was local matching funds.⁸⁹

SUMMARY

The terminology pertinent to the understanding of factors presented in this study was defined.

A section on vocational education needs in general was also included. This section stated that public schools must provide occupational training for 85 percent of its student population and that vocational-technical education will have 14,000,000 students by 1975. Vocational education trends were also reported.

Some varying approaches to the selection and construction of educational facilities were then presented. These approaches included comparative construction costs, the use of abandoned industrial sites, the educational facilities charette, and the community educational survey.

The reimbursement plan for vocational education in Kansas was then discussed. An explanation of the Kansas Division of Vocational Education's weighted systems approach was given.

The chapter ended with a discussion of the Kansas Division of Vocational Education's funding policy. Facts included in this section were that Kansas law prohibits the use of state funds for local school building construction, and that the Federal monies allotted to Kansas for vocational facility construction have gone only to area vocational-technical schools.

FOOTNOTES

¹U.S., Department of Labor, Vocational Education and Occupations (Washington: Government Printing Office, 1969), p. 58.

²U.S., Department of Health, Education and Welfare, Standard Terminology for Curriculum and Instruction in Local and State School Systems, ed. John F. Putnam and W. Dale Chismore (Washington: Government Printing Office, 1970), p. 157.

³U.S., Vocational Education and Occupations, op. cit., p. 4.

⁴Ibid., p. 7.

⁵U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 259.

⁶U.S., Vocational Education and Occupations, op. cit., p. 91.

⁷Ibid., p. 107.

⁸Ibid., p. 105.

⁹Kansas, Statutes Annotated, Volume 5A, Chapter 72, Article 44, Paragraph 4412 (Topeka: Kansas State Printer, 1972), p. 144.

¹⁰Ibid.

¹¹U.S., Vocational Education and Occupations, op. cit., p. 106.

¹²Ibid.

¹³U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 231.

¹⁴U.S., Vocational Education and Occupations, op. cit., p. 115.

¹⁵Ibid., p. 41.

¹⁶Ibid., p. 54.

¹⁷Ibid., p. 88.

¹⁸Ibid., p. 52.

¹⁹Ibid., p. 110.

²⁰Ibid., p. 130.

²¹Ibid., p. 54.

²²U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 259.

²³U.S., Vocational Education and Occupations, op. cit., p. 164.

²⁴Ibid., p. 171.

²⁵Ibid., p. 61.

²⁶Ibid., p. 29.

²⁷Ibid., p. 30.

²⁸Ibid., p. 125.

²⁹Ibid., p. 19.

³⁰Ibid., p. 125.

³¹Ibid., p. 116.

³²Ibid., p. 130.

³³Ibid., p. 86.

³⁴Ibid., p. 9.

³⁵Ibid., p. 8.

³⁶Ibid., p. 6.

³⁷U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 199.

³⁸U.S., Vocational Education and Occupations, op. cit., p. 24.

³⁹Ibid., p. 117.

⁴⁰Ibid., p. 51.

⁴¹Ibid., p. 12.

⁴²Ibid., p. 164.

⁴³Ibid., p. 92.

⁴⁴Ibid., p. 42.

⁴⁵Ibid., p. 149.

- ⁴⁶Ibid., p. 25.
- ⁴⁷Ibid., p. 49.
- ⁴⁸Ibid., p. 79.
- ⁴⁹Ibid., p. 147.
- ⁵⁰Ibid., p. 193.
- ⁵¹Ibid., p. 57.
- ⁵²U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 214.
- ⁵³U.S., Vocational Education and Occupations, op. cit., p. 56.
- ⁵⁴Ibid., p. 100.
- ⁵⁵Ibid., p. 108.
- ⁵⁶Ibid., p. 137.
- ⁵⁷Ibid., p. 133.
- ⁵⁸U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 195.
- ⁵⁹U.S., Vocational Education and Occupations, op. cit., p. 79.
- ⁶⁰U.S., Vocational Education and Occupations, op. cit., p. 198.
- ⁶¹U.S., Department of Labor, Dictionary of Occupational Titles, Vol. 1 of Definitions of Titles, 3d ed. (Washington: Government Printing Office, 1965), p. 562.
- ⁶²Kansas, Statutes Annotated, op. cit., p. 145.
- ⁶³U.S., Vocational Education and Occupations, op. cit., p. 157.
- ⁶⁴Joseph F. Nerden, Vocational-Technical Facilities for Secondary Schools--A Planning Guide (Columbus, Ohio: Council of Education Facility Planners, 1968), p. 5.
- ⁶⁵Milton E. Larsen and Duane L. Blake, Planning Facilities and Equipment for Comprehensive Vocational Education Programs for the Future (Washington: Office of Education, 1970), p. 21.
- ⁶⁶Ibid., p. 22.
- ⁶⁷Ibid., p. 28.

⁶⁸Ibid., pp. 23-26.

⁶⁹William V. Chase, et. al., Basic Planning Guide for Vocational and Technical Education Facilities (Washington: Department of Health, Education and Welfare, 1965), p. 5.

⁷⁰Louis J. Kishkumas, A Comprehensive Concept for Vocational Education Facilities: A School Planners Guide to the Pittsburgh Building Codes (Harrisburg: Bureau of Vocational, Technical, and Continuing Education, Pennsylvania Department of Public Instruction, 1966), p. 53.

⁷¹John H. Frederickson, "So You Want to Compare School Construction Costs?" American School and University, Vol. 45 (December, 1972), p. 16.

⁷²Ibid., p. 17.

⁷³Ibid., p. 18.

⁷⁴"Reclaimed Space for Vocational Schools," American School and University, Vol. 45 (December, 1972), pp. 24-25.

⁷⁵Ibid.

⁷⁶Larsen and Blake, op. cit., p. 45.

⁷⁷Ibid.

⁷⁸Ibid., p. 49.

⁷⁹Ibid., p. 52.

⁸⁰Kansas, State Plan for Vocational Education (Topeka: Division of Vocational Education, Kansas Department of Education, 1972), pp. 70-71.

⁸¹Ibid.

⁸²Ibid., p. 71.

⁸³Kansas, Vocational Education Activities in Kansas, 1968-1970 (Topeka: Kansas Vocational Education Research Coordinating Unit, 1971), p. 32.

⁸⁴Kansas, State Plan for Vocational Education, op. cit., p. 92.

⁸⁵Sharon Counts Johnson, Vocational Education Review Series, Number 5 (Washington: Washington: National Center for Educational Research and Development, 1972), p. 1.

⁸⁶Kansas, Vocational Education Activities in Kansas, 1968-1970, loc. cit.

⁸⁷Ibid., p. 33.

⁸⁸Ibid.

⁸⁹Ibid., p. 34.

Chapter 23

RESEARCH PROCEDURES

INTRODUCTION

The purpose of this chapter is to describe the research procedures and tools used to evaluate the hypotheses presented in Chapter 20.

INSTRUMENT AND DATA COLLECTION

The focus of this research was the reporting of data pertaining to the physical facilities at the fourteen area vocational-technical schools in Kansas. A survey instrument, found in Appendix I, was developed, field tested, refined, and forwarded to each area vocational-technical school director for his completion. Each director was asked to complete one questionnaire for each program under his supervision. Two weeks from the date the questionnaires were mailed to the directors, the investigator visited each school to gather the survey instrument and to discuss with each director any modifications the director might wish to suggest concerning the factual interpretation of the data pertaining to his school.

The questionnaire on which this study was based asked thirteen questions. Each question was designed to obtain information on specific topics pertaining to the physical facilities at the area vocational-technical schools.

The purpose of each of the thirteen questions of the questionnaire follow.

Question 1: Designed basically to elicit information pertaining to the number of instructors for each program and program type in the area vocational-technical schools.

Question 2: Directed toward obtaining the total "shop/laboratory" square footage for each school and program type.

Question 4: Sought information on the hours spent by the instructors in the "classroom" per day for each school and program type.

Question 5: Acquired information on the job placement percentage of the most recent graduating class for each school and program type.

Question 6: Designed to depict the student "overflow" for each school and program type.

Question 7: Sought information on the maximum number of students that could be taught per hour by school and program type.

Question 8: Designed to depict the number of students currently enrolled during each hour of the school day for each school and program type.

Question 9: Acquired information on program instructor opinion of the current condition of physical facilities for each school and program type.

Question 10: Sought information on the ownership of current physical facilities for each school and program type.

Question 11: Designed to discover whether or not there were any plans for program expansion for each school and program type.

Question 12: Sought specific information and justification of intended plans for program expansion for each school and program type.

Question 13: Acquired information on the approximated costs of expanding current physical facilities for each school and program type.

Upon completion of the personal interview phase of the survey, all instruments were compiled and tabulated to yield the following information.

1. The total square footage of instructional area and the student capacity at each Kansas area vocational-technical school.

2. The physical facility utilization rate, student overflow, student placement rate, student capacity and total student applications at the Kansas area vocational-technical schools by program type.

3. The funds requested for physical facility expansion by program type which will later be clustered into occupational categories identified by Price.¹

These three considerations served as the basis for analyzation and interpretation of the data collected during this survey.

THE POPULATION

The population for this study consisted of all full-time (secondary and post-secondary) programs offered by the fourteen area vocational-technical schools in Kansas. Appendix J identifies the programs found in the fourteen area schools.

STATISTICAL ANALYSIS

Spearman Rank Correlation Coefficient

The Spearman Rank Correlation Coefficient was selected as an appropriate statistical tool to use to determine the relationships between the variables compared in this study. This statistic is calculated by substituting ranks for each of the numeric categories in the variables being compared. This correlation coefficient was used to test Hypotheses 1, 2, 3, 5-A and 5-B in this study.

The Spearman Rank correlation technique is a nonparametric statistic which requires neither normality of distribution nor homogeneity of variance.² Ranks rather than numerical values are used in the computation of this statistic. The Spearman formula requires the calculation of the squares of the differences between each pair of ranks.³

The formula for the Spearman Rank Correlation Coefficient is:

$$r = 1 - \frac{6 \sum d^2}{N^3 - N}$$

where:

r represents the Spearman Rank Correlation Coefficient.

$\sum d^2$ represents the sum of the squared differences between the ranks of the two variables being compared.

N represents the total number of paired numeric categories for the two variables being compared.⁴

The first step in this technique was to arrange the two variables to be correlated in order of rank. The use of ranks gives less emphasis to extreme values by considering them as a rank in the order of value rather than considering their actual numeric value.⁵ This ranking was accomplished

for each pair of variables being compared in this study. These ranks are presented in Tables 4,5,6,8 and 9 of Chapter 23.

The next step in the Spearman formula was to compare the ranks of the paired variables being considered in precisely the same sequence as the original numeric values. Upon completion of this step, the difference between the ranks was determined for each pair of variables.

The differences of the ranked variables were then squared and summed. The final step was the calculation of the Spearman Rank Coefficient Correlation for each pair of ranked variables.

Interpretation of Correlation Coefficients

A correlation coefficient is an index of relationship between two variables. When this correlation is perfectly positive, the correlation will have a coefficient of one. When two variables are perfectly negatively correlated, an inverse relationship exists. This perfect negative correlation will have a coefficient of minus one. When there is no relationship between the two variables, the correlation will have a coefficient of zero.⁶

A correlation between .20 and .35 shows a very slight relationship between the variables. Crude group predictions may be achieved around .50. Accurate group predictions are possible for correlations at .65 or better. Correlations over .85 indicate close relationships and are rarely found in educational studies. Plus values are positive relationships, minus values, negative relationships.⁷

The Wilcoxon Matched-Pairs Signed-Ranks Test

The Wilcoxon matched-pairs signed-ranks test is a nonparametric alternative to the t-test for related measures and was used in this study for the disposition of Hypothesis 4. The Wilcoxon test demands equal N's, and continuously distributed ordinal data. It does not, however, require normal distribution.⁸

The procedure for computing the T values for the Wilcoxon test is to first rank the differences of the paired absolute values. The signs are ignored during this ranking procedure with the smallest difference being assigned a rank of 1.⁹

The signs are restored to the rankings and all positive rank values are summed. Then all negative ranked values are totaled. The test criterion is the smaller of these totals.¹⁰ If two or more differences are equal, the average of the ranks that would be assigned to the group of tied differences is assigned to each score in that group.¹¹

If the number of pairs (n) exceeds 16, the approximate normal deviate may be calculated by the formula:¹²

$$Z = (\bar{X} - T) - 1/2 / \sigma$$

where T is the smaller rank sum, and

$$\bar{X} = n(n + 1)/4$$

and

$$\sigma = \sqrt{(2n + 1)\bar{X}/6}$$

The number -1/2 is a correction for continuity and $Z > 1.96$ signifies rejection at the .05 level.¹³

COMPUTATION OF SELECTED CRITERIA

The computation of total square footage of instructional area at each Kansas area vocational-technical school was accomplished by summing the square footage reported for all programs at each school. Total student capacity by school was also summed for all programs reported by each area school.

Student overflow, or the number of students rejected because of limited space, was totaled for each program type and for each area vocational-technical school.

Program facility utilization rates were computed on the basis of actual student enrollment during the normal six-hour school day. Physical facilities were found to have very little use prior to 9:00 a.m. or after 4:00 p.m. The base established for each program was the reported student capacity. The number of students actually in class during the normal six-hour day was averaged. This average was then divided by reported full

capacity and the resulting percentage was labeled the program physical facility utilization rate. This study did not include the use of area school physical facilities for programs conducted at night.

The placement rates for graduates of programs at the Kansas area vocational-technical schools were averaged and reported in this study as placement rates by program type.

The total student applications by program were calculated by averaging the actual number of students enrolled during the six-hour day, and adding to this figure the student overflow reported for that program. The total potential student applications were reported in this study by program type.

The funds requested for program physical facility expansion were reported in response to Question 13 on the survey instrument used in this study. The instrument may be found in Appendix I. For use in this study, the monies were totaled for program type and then totaled according to the fifteen occupational clusters identified by Price.¹⁴

PROCEDURES FOR ANALYSIS

One of the techniques to be used in analyzing the need for additional state funds for physical facility expansion at the area vocational-technical schools in Kansas involves the computation of Spearman Rank Correlation Coefficients between:

1. School student capacity and physical facility size.
2. Program facility utilization rates and student overflow.
3. Program facility utilization rates and the placement rates of graduates.
4. Manpower needs and funds requested for expansion by program type.
5. Student interest and funds requested for expansion by program type.

A second technique involves the calculation of a t-statistic to determine the significance of the difference between full student capacity of physical facilities at the area vocational-technical schools in Kansas and the total number of applications to each program by potential students.

If a positive correlation is found between area school student capacity and physical facility size, it may be assumed that the size of the facility does affect student capacity and further study of the problem is indicated. If no significant correlation is found between these two variables, the vocational administrator may conclude that current physical facilities are adequate, or that other variables need to be investigated.

Program physical facility utilization rates will then be compared with the student overflow from programs in the Kansas area vocational-technical schools. If a significant positive correlation is found between these two variables, added support is indicated for the allocation of funds for physical facility expansion to those programs which must annually refuse training to large numbers of students due to lack of space. Should no significant correlation be found between these two variables, increased facility utilization is indicated.

Next, program facility utilization rates will be compared with student placement rates by program. If a significant positive correlation is found to exist between these two variables, those programs operating at or near full capacity with high placement rates should receive additional funds for physical facility expansion. No significant correlation between these two variables would indicate that program physical facility usage has little or no effect on program efficiency and further investigation is recommended.

If in comparison, total student applications by program prove to be significantly greater than full student capacity, consideration should be given to funding those requests for physical facility expansion from area school programs for which applications exceed capacity. Should student capacity be shown to be significantly greater than student applications by program, it could be assumed that adequate physical facility space exists for current area school programs. If, however, no significant difference is found to exist between these variables, it could be assumed that adequate area school space exists for all student applicants although it might mean that students may have to make different program selections or apply to different area schools in order to receive training.

The next comparison to be made will be between manpower needs and the funds requested for physical facility expansion by program. If a significant

positive correlation is found to exist between these variables, it could be assumed that Kansas area vocational-technical school directors have given high priority to manpower needs as a criterion in initiating their existing area school programs. Should no significant correlation be found to exist between these variables, the use of manpower needs as a criterion for the planning of future area school programs should be reemphasized.

The final comparison to be made in this study is between student interest and the funds requested for physical facility expansion by program at the area vocational-technical schools in Kansas. A significant positive correlation between these variables would indicate that area school directors have given high priority to student interest in the planning of existing area vocational-technical school programs. If no significant correlation is found between these two variables, consideration should be given to greater utilization of student interest as a criterion for program planning at the fourteen area vocational-technical schools in Kansas.

When the preceding comparisons of variables have been accomplished, the vocational administrators at the Kansas Department of Education will have additional information on which to base decisions concerning the allocation of state funds requested by the various area vocational-technical schools for physical facility expansion.

In making the last two comparisons stated above, the manpower needs and student interest used to plan programs in the area vocational-technical schools in Kansas as described by Price¹⁵ was used.

SUMMARY

The survey instrument used to collect the data for this study was developed to obtain specific information concerning the current use of physical facilities at the fourteen area vocational-technical schools in Kansas. This data was sought to give Kansas Department of Education vocational administrators information to be used in making decisions concerning the allocations of state funds for vocational physical facility expansion.

The data obtained was then tabulated for each program and each school. Spearman Rank Correlation Coefficients were calculated for the following pairs of variables.

1. Student capacity and square footage of instructional area.
2. Program physical facility utilization rates and student overflow.
3. Program physical facility utilization rates and placement rates.
4. Manpower needs and the funds requested for program physical facility expansion.
5. Student interest and the funds requested for program physical facility expansion.

The t-test for related measures was used to determine the relationship between full capacity utilization of existing physical facilities and student overflow from programs at the area vocational-technical schools.

The methods used to calculate the comparative criteria for the study such as square footage, student overflow, program physical facility utilization rates, placement rates, total student applications, and funds requested were then explained.

The procedures to be used in analyzing the data were also explained. This included the formulation of a series of logical processes to be tested through the statistical techniques presented earlier.

FOOTNOTES

¹R. G. Price, "The Use of Manpower Needs and Student Interest to Plan Vocational and Technical Programs in Kansas" (unpublished Doctor's dissertation, Kansas State University, 1973), pp. 54-62.

²John I. Griffin, Statistics Methods and Applications (New York: Holt, Rinehart and Winston, Inc., 1962), p. 270.

³Ibid.

⁴John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences (New York: Holt, Rinehart and Winston, Inc., 1969), pp. 82-83.

⁵Griffin, loc. cit.

⁶Roscoe, op. cit., p. 72.

⁷Walter E. Borg, Educational Research an Introduction (New York: David McKay Company, Inc., 1963), pp. 282-3.

⁸Roscoe, op. cit., p. 181.

⁹George W. Snedecor and William G. Cochran, Statistical Methods (6th ed., Ames, Iowa: Iowa State University Press, 1967), p. 128.

¹⁰Ibid.

¹¹Ibid., p. 129.

¹²Ibid.

¹³Ibid.

¹⁴Price, loc. cit.

¹⁵Ibid., p. 65.

Chapter 24

FINDINGS

INTRODUCTION

This chapter is concerned with the disposition of the research hypotheses presented in Chapter 20. A summary of raw data and findings is also included.

PRESENTATION OF RAW DATA

The raw data used to analyze the hypotheses is presented in Tables 21, 22 and 23. Table 21 contains data on student capacity and total square footage by school which was used to test Hypothesis 1. Table 22 contains data on facility utilization rate, overflow, placement rate, student capacity and total potential student applications by program type which was used to test Hypotheses 2, 3 and 4. Table 23 contains data on manpower needs, student interest and monies requested by program cluster which was used to test Hypotheses 5-Aa and 5-B. Table 11 presents the program clustering scheme used in this study.

DISPOSITION OF HYPOTHESIS 1

Hypothesis 1 which states "There is a high positive correlation between the total square footage of physical facilities and the student capacity at the fourteen Area Vocational Technical Schools in Kansas" was retained on the basis of a Spearman Rank Coefficient Correlation of .8626. This correlation indicated a very high degree of association between the total square footage of physical facilities and student capacity. Table 24 presents the data used to calculate this correlation.

TABLE 21
STUDENT CAPACITY AND TOTAL SQUARE FOOTAGE DATA
BY KANSAS AREA VOCATIONAL-TECHNICAL SCHOOL

School	Student Capacity	Total Square Footage
Central Kansas AVTS	640	86,972
Cowley County AVTS	271	27,632
Flint Hills AVTS	284	24,438
Kansas City AVTS	560	43,383
Kaw AVTS	602	71,871
Liberal AVTS	452	65,181
Manhattan AVTS	279	34,213
North Central Kansas AVTS	323	48,972
Northeast Kansas AVTS	323	29,394
Northwest Kansas AVTS	332	68,692
Salina AVTS	648	86,112
Southeast Kansas AVTS	396	63,804
Southwest Kansas AVTS	526	61,608
Wichita AVTS	2,479	186,637

TABLE 22

FACILITY UTILIZATION RATE, OVERFLOW, PLACEMENT
RATE, STUDENT CAPACITY, AND STUDENT
APPLICATIONS BY PROGRAM TYPE

Program Type	Facility Utilization Rate	Overflow	Placement Rate	Student Capacity	Student Applications
Accounting	.67	17	.66	53	53
Agri Business Technology	.72	0	1.00	25	18
Agricultural Production	1.25	0	.96	40	50
Agricultural Science	.50	0	1.00	24	12
Agriculture-Cooperative	1.15	0	.55	20	23
Agriculture-Vocational	.69	72	.80	193	204
Air Conditioning and Refrigeration	.88	24	.82	87	101
Aircraft Maintenance	.72	0	.57	47	34
Appliance Repair	.93	20	1.00	20	38
Auto Body Repair	1.00	100	.79	205	304
Auto Mechanics	.89	639	.74	830	1,376
Bricklaying	.72	0	.88	30	22
Business Education	.91	33	.86	109	141
Carpentry	.73	11	.88	213	187
Certified Laboratory Assistant	1.00	20	.85	32	52
Child Day Care	.45	0	.60	30	20
Civil Technology	.67	4	.90	20	17
Clothing	.59	30	.41	138	111
Commercial Art	.84	12	.82	49	53
Communications Technology	1.60	3	1.00	20	35

TABLE 22(continued)

Program Type	Facility Utilization Rate	Overflow	Placement Rate	Student Capacity	Student Applications
Cooperative Fashion Merchandising	.70	0	.60	20	14
Cooperative Industrial Training	.51	39	.73	166	123
Cosmetology	.81	30	.63	145	150
Cycle, Marine and Small Engine Repair	.98	16	.93	20	35
Data Processing	.69	22	.89	120	104
Dental Assistant	1.02	88	.80	41	130
Dental Hygienist	1.00	30	1.00	44	74
Diesel Mechanics	.77	18	.81	186	161
Distributive Education	.68	65	.74	540	430
Drafting	.68	25	.78	304	230
Electricity	.82	25	.61	198	186
Electronics	.68	39	.78	171	155
Engineering Technology	.43	0	1.00	120	50
Environmental Water Control	.81	0	1.00	16	13
Farm Mechanics	.57	2	1.00	72	43
Farm and Ranch Management	.59	16	.81	145	101
Fluid Power	.64	0	.14	20	13
Foods	.63	20	.74	58	61
Heavy Equipment	.87	8	.74	45	47
Home Economics	.67	10	.88	184	133
Horticulture	.84	6	.68	62	58

TABLE 22 (continued)

Program Type	Facility Utilization Rate	Overflow	Placement Rate	Student Capacity	Student Applications
Industrial Plastics	.74	0	.27	30	25
Instrumentation Technology	1.24	0	1.00	10	12
Licensed Practical Nurse	.87	543	.92	487	965
Machine Shop	.73	9	.82	273	208
Marketing	.69	0	.68	83	45
Medical Assistant	.51	0	.79	32	16
Medical Secretary	.74	5	.89	46	39
Metal Fabrication	.50	0	.82	12	12
Millwork and Cabinet Making	1.00	6	1.00	32	38
Office Education	.54	50	.73	871	517
Office Machines	.83	0	.55	20	16
Photography	.93	33	.56	20	52
Police Science	.90	0	.62	75	67
Power Mechanics	.99	35	.79	46	81
Printing	.82	40	.74	237	234
Radio - Television	.89	36	.76	64	93
Restaurant Management	1.00	0	.76	15	15
Secretarial	.80	60	.72	193	215
Special Trade and Industrial	.52	0	.71	195	100
Truck Driving	1.00	10	1.00	7	17
Welding	.85	65	.82	298	317

TABLE 23
MANPOWER NEEDS, STUDENT INTEREST AND FUNDS
REQUESTED BY OCCUPATIONAL CLUSTERS

Occupational Cluster ^a	Manpower Needs ^b	Student Interest ^c	Funds Requested
Agricultural Workers	17,224	46	\$ 591,822
Clerical Workers	60,751	161	289,828
Construction Workers	4,248	58	296,000
Drivers	5,275	43	5,000
Food Service Workers	11,411	25	74,000
Medical Workers	15,159	161	198,000
Mechanist Repairman	4,070	116	2,171,550
Metal Craftsmen	3,534	97	435,010
Printing Craftsmen	532	9	192,300
Protective Service Workers	1,404	24	0
Sales Workers	13,277	80	228,360
Service Workers, N.E.C.	11,361	67	69,000
Technicians, N.E.C.	1,672	176	453,460
Textile Occupation Workers	1,086	34	44,000
Transportation and Public Utilities Workers	741	22	0

^aR. G. Price, "The Use of Manpower Needs and Student Interest to Plan Vocational and Technical Programs in Kansas" (unpublished Doctor's dissertation, Kansas State University, 1973), pp. 54-62. (See Appendix C of this study.)

^bIbid., p. 63.

^cIbid.

TABLE 24

SPEARMAN RANK CORRELATION COEFFICIENT DATA FOR
STUDENT CAPACITY VERSUS TOTAL SQUARE FOOTAGE

School	Student Capacity Rank	Total Square Footage Rank	d	d ²
Central Kansas AVTS	3	2	1	1
Cowley County AVTS	14	13	1	1
Flint Hills AVTS	12	14	2	4
Kansas City AVTS	5	10	5	25
Kaw AVTS	4	4	0	0
Liberal AVTS	7	6	1	1
Manhattan AVTS	13	11	2	4
North Central AVTS	10.5	9	1.5	2.25
Northeast AVTS	10.5	12	1.5	2.25
Northwest AVTS	9	5	4	16
Salina AVTS	2	3	1	1
Southeast Kansas AVTS	8	7	1	1
Southwest Kansas AVTS	6	8	2	4
Wichita AVTS	1	1	0	0

$$\sum d^2 = 62.50$$

$$r = .8626$$

DISPOSITION OF HYPOTHESIS 2

Hypothesis 2 which states "There is a high positive correlation between program physical facility utilization and the number of students who request admittance to a program but cannot be served (Overflow)" was rejected on the basis of a Spearman Rank Correlation Coefficient of .1935.

Since correlations less than .20 indicate practically no degree of relationship, the association between program facility utilization and overflow was determined to be negligible. Table 25 presents the data used to calculate this correlation.

DISPOSITION OF HYPOTHESIS 3

Hypothesis 3 which states "There is a negative correlation between program physical facility usage and the program placement rates of graduates from the Kansas Area Vocational Technical Schools" was rejected on the basis of a Spearman Rank Correlation Coefficient of .2039. Since the indicated degree of relationship was in fact positive, it was determined that there was a very slight degree of association between program physical facility usage and program placement rates. Table 26 presents the data used to calculate this correlation.

DISPOSITION OF HYPOTHESIS 4

Hypothesis 4 which states "There is no significant difference between 100 percent student capacity of physical facilities and total potential student applications at the Kansas Area Vocational Technical Schools" was retained on the basis of a calculated Z-score of .9284 which was well below the $Z > 1.96$ which signifies rejection at the .05 level. This meant that the annual number of potential student applications could probably be served if students would enroll in those types of programs that had available training stations. It does not mean that every potential student can get the type of training he desires. Table 27 presents the data used to calculate the Wilcoxon T values and resulting Z-score.

TABLE 25

SPEARMAN RANK COEFFICIENT DATA FOR FACILITY
UTILIZATION RATE VERSUS OVERFLOW

Program Type	Facility Utilization Rate Rank	Overflow Rank	d	d ²
Accounting	48	28	20	400
Agri-Business Technology	38	52.5	14.5	210.25
Agricultural Production	2	52.5	50.5	2,550.25
Agricultural Science	59.5	52.5	7	49
Agriculture-Cooperative	4	52.5	48.5	2,352.25
Agriculture-Vocational	42	5	37	1,369
Air Conditioning and Refrigeration	20	22	2	4
Aircraft Maintenance	38	52.5	14.5	210.25
Appliance Repair	14.5	25	10.5	110.25
Auto Body Repair	8.5	3	5.5	30.25
Auto Mechanics	18.5	1	17.5	306.25
Bricklaying	38	52.5	14.5	210.25
Business Education	16	15.5	.5	.25
Carpentry	35.5	32	3.5	12.25
Certified Laboratory Assistant	8.5	25	16.5	272.25
Child Day Care	61	52.5	8.5	72.25
Civil Technology	48	40	8	64
Clothing	52.5	18	34.5	1,190.25
Commercial Art	24.5	31	6.5	42.25
Communications Technology	1	41	40	1,600
Cooperative Fashion Merchandising	40	42.5	2.5	6.25

TABLE 25(continued)

Program Type	Facility Utilization Rate Rank	Overflow Rank	d	d ²
Cooperative Industrial Training	57.5	11.5	46	2,116
Cosmetology	29.5	18.0	11.5	132.25
Cycle, Marine and Small Engine Repair	13	29.5	16.5	272.25
Data Processing	42	23	19	361
Dental Assistant	5	4	1	1
Dental Hygienist	8.5	18	9.5	90.25
Diesel Mechanic	33	27	6	36
Distributive Education	45	6.5	38.5	1,482.25
Drafting	45	20.5	24.5	600.25
Electricity	27.5	20.5	7	49
Electronics	45	11.5	33.5	1,122.25
Engineering Technology	62	52.5	9.5	90.25
Environmental Water Control	29.5	52.5	23	529
Farm Mechanics	54	42	12	144
Farm and Ranch Management	52.5	29.5	23	529
Fluid Power	50	52.5	2.5	6.25
Foods	51	25	26	676
Heavy Equipment	21.5	36	15.5	240.25
Home Economics	48	33.5	14.5	210.25
Horticulture	24.5	37.5	10.5	182.25
Industrial Plastics	32	52.5	20.5	420.25

TABLE 25 (continued)

Program Type	Facility Utilization Rate Rank	Overflow Rank	d	d ²
Instrumentation Technology	3	52.5	49.5	2,450.25
Licensed Practical Nurse	21.5	2	19.5	380.25
Machine Shop	35.5	35	.5	.25
Marketing	42	52.5	10.5	110.25
Medical Assistant	57.5	52.5	5	25
Medical Secretary	34	39	5	25
Metal Fabrication	59.5	52.5	7	49
Millwork and Cabinet Making	8.5	37.5	29	841
Office Education	55	9	46	2,116
Office Machines	26	52.5	26.5	702.25
Photography	14.5	15.5	1	1
Police Science	17	52.5	35.5	1,260.25
Power Mechanic	12	14	2	4
Printing	27.5	10	17.5	306.25
Radio and Television	18.5	13	5.5	30.25
Restaurant Management	8.5	52.5	44	1,936
Secretarial	31	8	23	529
Special Technical and Industrial	56	52.5	3.5	12.25
Truck Driving	8.5	33.5	25	625
Welding	23	6.5	16.5	272.25

$$\Sigma d^2 = 32,027.25$$

$$r = .1935$$

TABLE 26

SPEARMAN RANK CORRELATION COEFFICIENT DATA FOR FACILITY
UTILIZATION RATE VERSUS PLACEMENT RATE

Program Type	Facility Utilization Rate Rank	Placement Rate Rank	d	d ²
Accounting	48	50	2	4
Agri-Business Technology	38	5.5	32.5	1,056.25
Agricultural Production	2	12	10	100
Agricultural Science	59.5	5.5	54	2,916
Agriculture-Cooperative	4	58.5	54.5	2,970.25
Agriculture-Vocational	42	30.5	11.5	132.25
Air Conditioning and Refrigeration	20	23	3	9
Aircraft Maintenance	38	56	18	324
Appliance Repair	14.5	5.5	9	81
Auto Body Repair	8.5	33	24.5	600.25
Auto Mechanics	18.5	41	22.5	506.25
Bricklaying	38	19	19	361
Business Education	16	21	5	25
Carpentry	35.5	19	16.5	272.25
Certified Laboratory Assistant	8.5	22	13.5	182.25
Child Day Care	61	54.5	6.5	42.25
Civil Technology	48	15	33	1,089
Clothing	52.5	60	7.5	56.25
Commercial Art	24.5	25	.5	.25
Communications Technology	1	5.5	4.5	20.25
Cooperative Fashion Merchandising	40	54.5	14.5	210.25
	280			

TABLE 26(continued)

Program Type	Facility Utilization Rate Rank	Placement Rate Rank	d	d ²
Cooperative Industrial Training	57.5	44.5	13	169
Cosmetology	29.5	51	21.5	462.25
Cycle, Marine and Small Engine Repair	13	13	0	0
Data Processing	42	16.5	25.5	650.25
Dental Assistant	5	30.5	25.5	650.25
Dental Hygienist	8.5	5.5	3	9
Diesel Mechanic	33	28.5	4.5	20.25
Distributive Education	45	41	4	16
Drafting	45	35.5	9.5	90.25
Electricity	27.5	53	25.5	650.25
Electronics	45	35.5	9.5	90.25
Engineering Technology	62	5.5	56.5	3,192.25
Environmental Water Control	29.5	5.5	24	576
Farm Mechanics	54	5.5	48.5	2,352.25
Farm and Ranch Management	52.5	28.5	24	576
Fluid Power	50	62	12	144
Foods	51	41	10	100
Heavy Equipment	21.5	41	19.5	380.25
Home Economics	48	19	29	841
Horticulture	24.5	48.5	24	576
Industrial Plastics	32	61	29	841

TABLE 26(continued)

Program Type	Facility Utilization Rate Rank	Placement Rate Rank	d	d ²
Instrumentation Technology	3	5.5	1.5	2.25
Licensed Practical Nurse	21.5	14	7.5	56.25
Machine Shop	35.5	25	10.5	110.25
Marketing	42	48.5	6.5	42.25
Medical Assistant	57.5	33	14.5	210.25
Medical Secretary	34	16.5	17.5	306.25
Metal Fabrication	59.5	25	34.5	1,190.25
Millwork and Cabinet Making	8.5	5.5	3	9
Office Education	55	44.5	10.5	110.25
Office Machines	26	58.5	32.5	1,056.25
Photography	14.5	57	42.5	1,806.25
Police Science	17	52	35	1,225
Power Mechanics	12	33	21	441
Printing	27.5	41	13.5	182.25
Radio and Television	18.5	37.5	19	361
Restaurant Management	8.5	37.5	29	841
Secretarial	31	46	15	225
Special Technical and Industrial	56	47	9	81
Truck Driving	8.5	5.5	3	9
Welding	23	25	2	4

$$\Sigma d^2 = 31,613.25$$

$$r = .2039$$

TABLE 27

WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST DATA FOR 100 PERCENT
PROGRAM CAPACITY VERSUS TOTAL STUDENT APPLICATIONS

Program	100 Percent Program Capacity	Total Student Applications	d	Rank	Positive	Negative
Accounting	53	53	0	0.0		
Agri-Business Technology	25	18	-7	16.0		16.0
Agricultural Production	40	50	10	21.0	21.0	
Agricultural Science	24	12	-12	24.5		24.5
Agriculture-Cooperative	20	23	3	5.0	5.0	
Agriculture-Vocational	193	204	11	23.0	23.0	
Air Conditioning and Refrigeration	87	101	14	27.0	27.0	
Aircraft Fabrication	47	34	-13	26.0		26.0
Appliance Repair	20	38	18	33.0	33.0	
Auto Body Repair	205	304	99	55.0	55.0	
Auto Mechanics	830	1,376	546	59.0	59.0	
Bricklaying	30	22	-8	18.5		18.5

TABLE 27 (continued)

Program	100 Percent Program Capacity	Total Student Applications	d	Rank	Positive	Negative
Business Education	109	141	32	43.5	43.5	
Carpentry	213	187	-26	38.0		38.0
Certified Laboratory Assistant	32	52	20	35.5	35.5	
Child Day Care	30	20	-10	21.0		21.0
Civil Technology	20	17	-3	5.0		5.0
Clothing	138	111	-27	39.0		39.0
Commercial Art	49	53	4	9.0	9.0	
Communications Technology	20	35	15	28.5	28.5	
Cooperative Fashion Merchandising	20	14	-6	13.5		13.5
Cooperative Industrial Training	166	123	-43	47.0		47.0
Cosmetology	145	150	5	11.5	11.5	
Cycle, Marine and Small Engine Repair	20	35	15	28.5	28.5	

TABLE 27 (continued)

Program	100 Percent Program Capacity	Total Student Applications	d	Rank	Positive	Negative
Data Processing	120	104	-16	31.0		31.0
Dental Assistant	41	130	89	53.0	53.0	
Dental Hygienist	44	74	30	42.0	42.0	
Diesel Mechanics	186	161	-20	35.5		35.5
Distributive Education	540	430	-110	56.0		56.0
Drafting	304	230	-74	52.0		52.0
Electricity	198	186	-12	24.5		24.5
Electronics	171	155	-16	31.0		31.0
Engineering Technology	120	50	-70	51.0		51.0
Environmental Water Control	16	13	-3	5.0		5.0
Farm Mechanics	72	43	-29	40.5		40.5
Farm and Ranch Management	145	101	-44	48.0		48.0
Fluid Power	20	13	-7	16.0		16.0
Foods	58	61	3	5.0	5.0	
Heavy Equipment	45	47	2	1.5	1.5	

TABLE 27 (continued)

Program	100 Percent Program Capacity	Total Student Applications	d	Rank	Positive	Negative
Home Economics	184	133	-51	49.0		49.0
Horticulture	62	58	-4	9.0		9.0
Industrial Plastics	30	25	-5	11.5		11.5
Instrumentation Technology	10	12	2	1.5	1.5	
Licensed Practical Nurse	487	965	478	58.0	58.0	
Machine Shop	273	208	-65	50.0		50.0
Marketing	83	45	-38	46.0		46.0
Medical Assistant	32	16	-16	31.0		31.0
Medical Secretary	46	39	-7	16.0		16.0
Metal Fabrication	12	12	0	0.0		
Millwork and Cabinet Making	32	38	-6	13.5		13.5
Office Education	871	517	-354	57.0		57.0
Office Machines	20	16	-4	9.0		9.0
Photography	20	52	32	43.5	43.5	
Police Science	75	67	-8	18.5		18.5

TABLE 27 (continued)

Program	100 Percent Program Capacity	Total Student Applications	d	Rank	Positive	Negative
Power Mechanics	46	81	35	45.0	45.0	
Printing	237	234	-3	5.0		5.0
Radio and Television	64	93	29	40.5	40.5	
Restaurant Management	15	15	0	0.0		
Secretarial	193	215	22	37.0	37.0	
Special Technical and Industrial	195	100	-95	54.0		54.0
Truck Driving	7	17	10	21.0	21.0	
Welding	298	317	19	34.0	34.0	

 $T_a = 761.5$
 $T_b = 1,008.5$
 $Z = .9284$

DISPOSITION OF HYPOTHESIS 5-A

Hypothesis 5-A which states "There is a high positive correlation between manpower needs relative to particular training programs and the funds requested for program facility expansion at the Kansas Area Vocational Technical Schools" was rejected on the basis of a Spearman Rank Correlation Coefficient of .3509. Since this correlation was so near the .20 to .35 range which indicates only a slight relationship between variables, it was determined that manpower needs had little effect on the funds requested for program facility expansion. Table 28 presents the data from which this correlation coefficient was calculated.

DISPOSITION OF HYPOTHESIS 5-B

Hypothesis 5-B which states "There is a high positive correlation between student interest in particular programs and the funds requested for program physical facility expansion at the Kansas Area Vocational Technical Schools" was retained on the basis of a Spearman Rank Correlation Coefficient of .6714. Since correlations of .65 or higher are considered appropriate for accurate group predictions, it was determined that a correlation coefficient of .6714 indicated a reasonably high degree of relationship between student interest and the funds requested for program physical facility expansion. Table 29 presents the data from which the correlation coefficient was calculated.

SUMMARY

The following findings were described in this chapter from the relationships found to exist between student capacity, total square footage, physical facility utilization rate, student overflow, placement rate, student capacity, total potential student applications, manpower needs, student interest and monies requested for programs at the fourteen area vocational-technical schools in Kansas.

1. There was a high degree of relationship between the total square footage of instructional area and the student capacity.

TABLE 28
SPEARMAN RANK COEFFICIENT DATA FOR MANPOWER
NEEDS VERSUS MONIES REQUESTED

Occupational Clusters ^a	Manpower Needs Rank ^b	Monies Requested Rank	d	d ²
Clerical Workers	1	6	5	25
Agricultural Workers	2	2	0	0
Medical Workers	3	8	5	25
Sales Workers	4	7	3	9
Service Workers, N.E.C.	5	11	6	36
Food Service Workers	6	10	4	16
Drivers and Deliverymen	7	13	6	36
Construction Workers	8	5	3	9
Mechanics and Repairmen	9	1	8	64
Metal Craftsmen	10	4	6	36
Technicians N.E.C.	11	3	8	64
Protective Service Workers	12	14.5	2.5	6.25
Textile Occupations	13	12	1	1
Transportation and Public Utilities N.E.C.	14	14.5	.5	.25
Printing Craftsmen	15	9	6	36

$$\Sigma d^2 = 363.5$$

$$r = .3509$$

^aR. G. Price, "The Use of Manpower Needs and Student Interest to Plan Vocational and Technical Programs in Kansas" (unpublished Doctor's dissertation, Kansas State University, 1973), p. 65.

^bIbid.

TABLE 29

SPEARMAN RANK COEFFICIENT DATA FOR STUDENT
INTEREST VERSUS MONIES REQUESTED

Occupational Clusters ^a	Student Interest Rank ^b	Monies Requested Rank	d	d ²
Technicians N.E.C.	1	3	2	4
Clerical Workers	2.5	6	3.5	12.25
Medical Workers	2.5	8	5.5	30.25
Mechanics and Repairmen	4	1	3	9
Metal Craftsmen	5	4	1	1
Sales Workers	6	7	1	1
Service Workers N.E.C.	7	11	4	16
Construction Workers	8	5	3	9
Agricultural Workers	9	2	7	49
Drivers and Deliverymen	10	13	3	9
Textile Occupations	11	12	1	1
Food Service Workers	12	10	2	4
Protective Service Workers	13	14.5	1.5	2.25
Transportation and Public Utilities N.E.C.	14	14.5	.5	.25
Printing Craftsmen	15	9	6	36

$$\sum d^2 = 184$$

$$r = .6714$$

^aR. G. Price, "The Use of Manpower Needs and Student Interest to Plan Vocational and Technical Programs in Kansas" (unpublished Doctor's dissertation, Kansas State University, 1973), p. 65.

^bIbid.

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2. Only a very slight relationship was found to exist between physical facility utilization and student overflow.

3. Only a very slight relationship was found to exist between physical facility utilization rates and the placement rates of graduates.

4. No significant difference was found to exist between full capacity of physical facilities and total potential student applications.

5. Only a very slight relationship was found to exist between manpower needs and the funds requested for program physical facility expansion.

6. A reasonably high relationship was found to exist between student interest and the funds requested for programs.

Chapter 25

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

INTRODUCTION

This chapter contains a summary of the problem, procedures and findings of this study. Conclusions based on an analysis and interpretation of the findings are also included. This chapter ends with a list of recommendations derived from the findings and conclusions.

SUMMARY

This study was undertaken at the request of the directors of the fourteen area vocational-technical schools in Kansas and the administrators from the Division of Vocational Education, Kansas Department of Education.

The problem investigated by this study was "Is there justification for the renovation and/or construction of physical facilities at the fourteen area vocational-technical schools in Kansas?"

Related published materials indicate that public schools must provide 85 percent of their students with vocational training by 1975. This means that a total of 14,000,000 students in the United States should be receiving vocational-technical training in the public schools by 1975.

Examples of varying approaches to the acquisition of vocational-technical school facilities are the community educational survey, the educational facilities charette, the abandoned industrial site, and comparative construction costs.

Kansas law prohibits the use of state funds for local school construction, and to date, Federal monies granted to the Kansas Division of Vocational Education for vocational school construction have been allocated only to the area vocational-technical schools.

High degrees of relationship were found to exist between total square footage of instructional area and student capacity, and between student

interest and the funds requested by program. Insignificant relationships were found to exist between physical facility utilization rates and student overflow, between physical facility utilization rates and placement rates, and between manpower needs and the funds requested for physical facility expansion. No significant difference was found to exist between full capacity of physical facilities and the total potential student applications by program.

CONCLUSIONS

The following conclusions are based on the findings of this study.

1. Monies used to expand physical facilities for certain types of programs would increase the number of students who could be served by those program types.
2. A program type with a high number of applicants at one school does not necessarily have a high number of applicants at all schools.
3. Students are either unaware of training opportunities in other area schools, or are unwilling or unable to acquire the training they desire by attending area schools other than the one to which they originally applied.
4. The number of students in a given program could be increased to full capacity without decreasing the effectiveness of the program.
5. If some students could be channeled into programs other than the ones they requested, it would be possible to provide training for all applicants.
6. In order to achieve full capacity utilization, the student applicants must be willing to relocate to attend area schools other than the one to which they applied, and willing to enroll in training programs where openings exist.
7. Area school directors, when requesting funds for physical facility expansion, are responding to the desires of students and are not necessarily considering the manpower needs of the labor force.

RECOMMENDATIONS

The following recommendations are based on the findings and conclusions of this study.

1. Before physical facilities at the Kansas area vocational-technical schools are expanded, the use of existing physical facilities beyond the present six hour day should be investigated.

2. Increased efforts should be made to inform potential area school students about job opportunities so that they can make more realistic choices relative to training programs.

3. Before programs are initiated or expanded in the area schools, directors should consider programs where there is both a high student interest and high manpower needs.

4. The Kansas Department of Education, Division of Vocational Education should formulate a philosophy and a definite policy under which area school programs are to be expanded or initiated.

5. The Kansas State Department of Education should consider establishing the position of a statewide planner of vocational education to facilitate unbiased decisions concerning the allocation of state and federal monies.

Part 6

PARTICIPATION RATES OF DISADVANTAGED AND HANDICAPPED
GROUPS IN KANSAS AREA VOCATIONAL AND
TECHNICAL SCHOOL PROGRAMS

David L. Jones

Chapter 26

THE PROBLEM

INTRODUCTION

Since World War II, technology has made significant advances in the United States. Relative to the composition of the total labor force, unskilled jobs are decreasing in importance as a source of new employment. People without special knowledges or skills will have difficulty entering the mainstream of employment in this restructured labor force.¹

Some Americans, for various reasons, are finding it difficult to acquire sufficient knowledge or skills for employment. Included in this group who are having problems preparing for skilled employment are persons from minority races, economically and academically disadvantaged individuals or persons who are mentally or physically handicapped.²

Occupational training for the disadvantaged and handicapped presents special problems to the educator. He has little information regarding the participation of people in the above mentioned categories in vocational or technical education and, hence, cannot start to anticipate factors which might contribute to program preference by disadvantaged and handicapped groups. Education administrators, therefore, may often be forced to make decisions without sufficient background data.³

There are fourteen area vocational and technical schools in Kansas, each of which has been designed to provide occupational training for a roughly defined geographic area. Although students from any part of Kansas may enroll in any area school, certain school districts directly support an area school financially and provide the overwhelming majority of students. For the purposes of this study, the people in the communities which financially support the area school are considered to be the population which the area school serves. Figure 9 is a graphic description of the communities which each area school serves.

- (1) Central Kansas AVTS
- (2) Cowley County AVTS
- (3) Flint Hills AVTS
- (4) Kansas City AVTS
- (5) Kaw AVTS
- (6) Liberal AVTS
- (7) Manhattan AVTS
- (8) North Central AVTS
- (9) Northeast Kansas AVTS
- (10) Northwest Kansas AVTS
- (11) Salina AVTS
- (12) Southeast Kansas AVTS
- (13) Southwest Kansas AVTS
- (14) Wichita AVTS

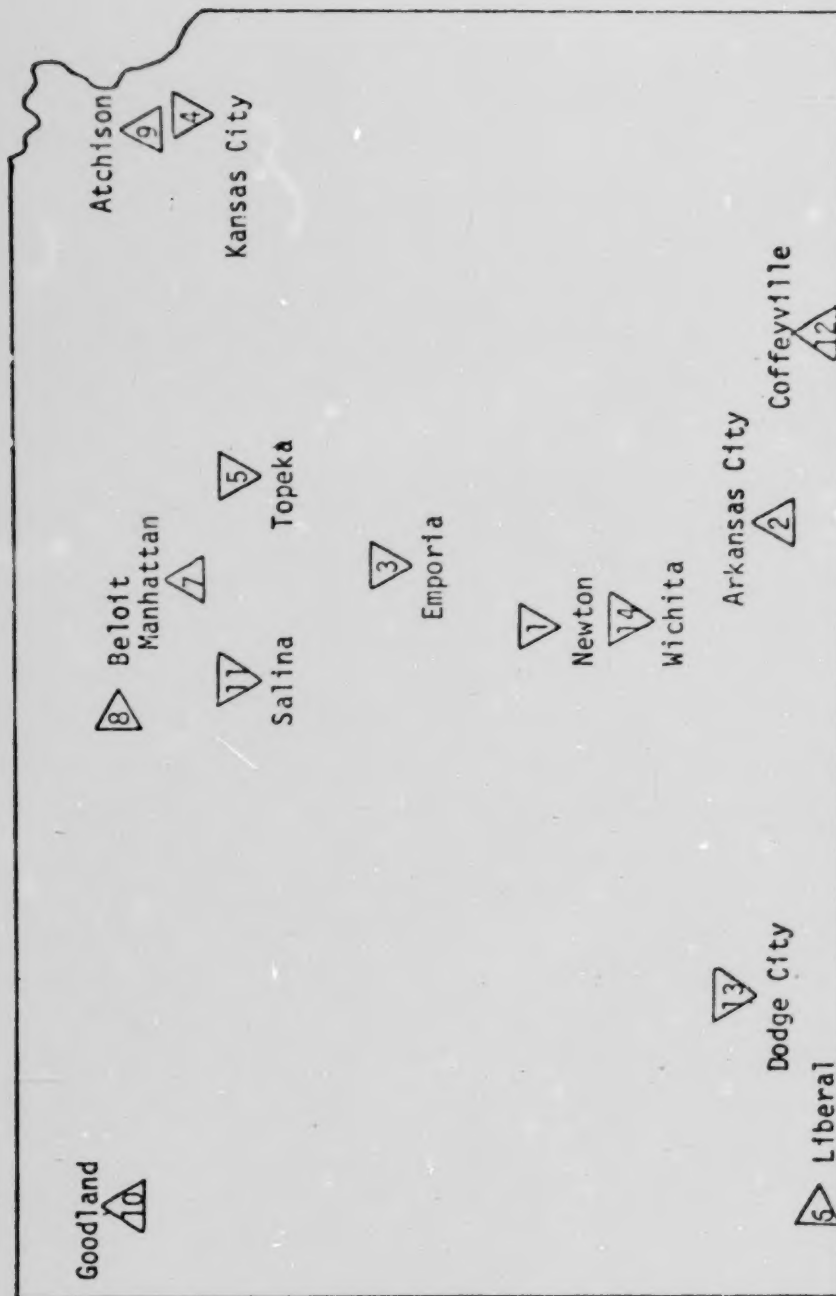


Figure 9

The Area Vocational-Technical School System in Kansas and Locations

Each area school offers a wide variety of training programs. Enrollment is open on a first-come-first-served basis;⁴ therefore, if the proportion of disadvantaged and handicapped students is significantly greater in one program than in others, it is logical to assume the program is preferred by this type of student.

Traditionally, area schools have more student applicants than they can accommodate. It is possible the first-come-first-served policy in fact constitutes a discriminatory selection procedure in that those not disadvantaged or handicapped are probably more readily aware of the training opportunities available. Of course, some training programs tend to reach their enrollment limits before others which might force disadvantaged and handicapped students to enroll in the programs which are slower to reach enrollment limits.

Programs of the same types in different schools should be examined in terms of proportion of disadvantaged and handicapped enrolled to support or detract from the above two theories. For example, if an examination of the proportion of disadvantaged and handicapped enrollment in the several schools indicates different selection procedures, some of which discriminate, then it would be expected that programs of the same type in the different schools would have different disadvantaged and handicapped enrollment rates.

PURPOSE OF THE STUDY

The purpose of this study is to examine the participation rates of minority groups, economically disadvantaged groups, academically disadvantaged groups and mentally or physically handicapped groups in vocational education which was conducted at the fourteen area vocational and technical schools in Kansas during the 1972-73 school year. The participation rates will be analyzed in light of the numbers of disadvantaged or handicapped persons in the geographic area to be served and in terms of program type versus program type, and program versus program of a single type in the different schools.

It is anticipated that the results of this study will aide vocational education administrators at both state and local levels to identify those handicapped and disadvantaged groups who are not being proportionately served by vocational education and hence to adjust the program mix to better meet

the needs of all students to be served.

NEED FOR THE STUDY

Improvement of the social and economic conditions of disadvantaged and handicapped groups has been a major domestic issue during the last decade and a half. During President Nixon's administration, there has been a continuing emphasis on vocational education as part of the solution to this problem.⁵ Some legislation passed during this period provides specific funds for the training of the disadvantaged and handicapped.⁶

To derive maximum benefit from these funds, vocational educators need to know which types of training best serve the disadvantaged and handicapped.

During a discussion with state officials in Kansas it was learned that:⁷

1. The Division of Vocational Education of the Kansas State Department of Education is not satisfied with the quality of data presently available on the participation of the disadvantaged and handicapped in vocational education.

2. The Division of Vocational Education of the Kansas State Department of Education has identified this type of data as critical for planning vocational education throughout Kansas.

3. The Division of Vocational Education of the Kansas State Department of Education has identified the vocational area schools as one of the most vital vehicles for training the disadvantaged and handicapped.

In summary, there is a critical need to determine the present status of disadvantaged and handicapped enrollment in vocational education in Kansas' area schools. In addition, there is a need to determine what programs seem to best serve the disadvantaged and handicapped.

STATEMENT OF THE PROBLEM

This study will attempt to answer the question, "Do the disadvantaged and handicapped participate proportionately in vocational training programs offered in the fourteen Kansas area vocational and technical schools?"

ASSUMPTIONS

The analysis and interpretation of data attempted in this study were based on the following assumptions.

1. The disadvantaged and handicapped students in Kansas vocational education have enrolled in the programs of their choice relative to those programs available.
2. Teachers will be able to identify students who are academically or economically disadvantaged and/or mentally or physically handicapped.
3. Estimates of the disadvantaged and handicapped populations in the area to be served, which are derived from Kansas Manpower Utilization System for Training project studies and the 1970 U.S. Census are valid.

LIMITATIONS AND DELIMITATIONS

The conclusions and recommendations developed in this study are subject to the following limitation and delimitation.

1. The study is restricted to the 1972 fall enrollment in fourteen area schools in Kansas.
2. The study relies on teacher identification of disadvantaged and handicapped students.

HYPOTHESES TO BE TESTED

The following hypotheses will be statistically tested in this study.

Hypothesis 1

There is a significant difference between the proportion of vocational students who are academically disadvantaged and the proportion of the population to be served who are academically disadvantaged.

Hypothesis 2

There is a significant difference between the proportion of vocational students who are from a minority group and the proportion of the population to be served who are from a minority group.

Hypothesis 3

There is a significant difference between the proportion of vocational students who are economically disadvantaged and the proportion of the population to be served who are economically disadvantaged.

Hypothesis 4

There is a significant difference between the proportion of vocational students who are mentally handicapped and the proportion of the population to be served who are mentally handicapped.

Hypothesis 5

There is a significant difference between the proportion of vocational students who are physically handicapped and the proportion of the population to be served who are physically handicapped.

Hypothesis 6

There is a significant difference between vocational program types relative to the proportion of academically disadvantaged students enrolled.

Hypothesis 7

There is a significant difference between vocational program types relative to the proportion of minority students enrolled.

Hypothesis 8

There is a significant difference between vocational program types relative to the proportion of economically disadvantaged students enrolled.

Hypothesis 9

There is a significant difference between vocational program types relative to the proportion of mentally handicapped students enrolled.

Hypothesis 10

There is a significant difference between vocational program types relative to the proportion of physically handicapped students enrolled.

Hypothesis 11

For a particular type of vocational training, there is a significant difference between the proportion of academically disadvantaged students enrolled in different schools.

Hypothesis 12

For a particular type of vocational training, there is a significant difference between the proportion of minority students enrolled in different schools.

Hypothesis 13

For a particular type of vocational training, there is a significant difference between the proportion of economically disadvantaged students enrolled in different schools.

Hypothesis 14

For a particular type of vocational education, there is a significant difference between the proportion of mentally handicapped students enrolled in different schools.

Hypothesis 15

For a particular type of vocational education, there is a significant difference between the proportion of physically handicapped students enrolled in different schools.

DEFINITION OF TERMS

Academically Disadvantaged

Persons with a learning disability that need additional special training and persons 25 years old or older who have not graduated from the eighth grade.⁸

Agribusiness Technology

A combination of subject matter and learning experiences designed to teach basic principles and management decisions involved in the science and technology of farm products, including marketing, inspection and processing.⁹

Agricultural Diesel Mechanics

A combination of subject matter and experiences designed to develop in pupils the abilities to (1) recognize and identify the fundamental principles of selection, operation, service maintenance, repair, and safety in agricultural power--engines, electricity, and hydraulics, and (2) plan,

install, service assemble, adjust, operate, and repair farm machinery.¹⁰

Agricultural Production

Subject matter and learning activities which are concerned with the principles and processes involved in the planning related to and the economic use of facilities, land, water, machinery, chemicals, finance, and labor in the production of plant and animal products. Activities include classroom instruction and laboratory experiences in and out of school, including farms, ranches and other agriculturally related establishments.¹¹

Air Conditioning and Refrigeration

Classroom and shop experience concerned with commercial chilling and freezing systems, including theory, application, and operating of compressors, expansion and float valves, thermostats, and pressure controls; diagnosing, overhauling, and testing methods and procedures; charging and discharging systems with refrigerants; and testing hermetic units, relays, and overload devices.¹²

Aircraft Maintenance

Classroom and shop experiences concerned with the inspection, repair, servicing, and overhauling of all airplane parts including engines, propellers, instruments, airframes, fuel and oil tanks, control cables, and hydraulic units. Learning the use of technical manuals and various kinds of testing equipment is also emphasized.¹³

Appliance Repair

Classroom and shop experiences concerned with the theory of electrical circuitry, simple glaring, linkages, and lubrication in the operation, maintenance, and repair of components including relays, time switches, pumps, and agitators used in appliances such as washers, dryers, vacuum cleaners, toasters, water heaters, and stoves. Related training is provided in the uses of familiar tools, test equipment, and service manuals, and in making cash estimates for repair.¹⁴

Area School System

A Kansas system of area vocational-technical schools, i.e., the fourteen area vocational-technical schools in Kansas.

Area Vocational School

Any vocational education school which is organized and approved by the state board and is operated under an elected board of education of a school district, or a board of trustees of a community junior college, or as a part of an institution under the state board of regents or the board of regents of a municipal university.¹⁵

Area Vocational-Technical Schools

Any vocational education school, the governing body of which is elected from among candidates from those districts participating in and acting as the financial base for funding purposes.¹⁶

Auto Body Repair

Specialized learning experiences concerned with all phases of repairing damaged bodies and fenders including metal straightening by hammering, smoothing areas by filing, grinding or sanding, concealment of imperfections, painting, and replacement of body components, including trim.¹⁷

Auto Mechanic

Learning experiences concerned with the components of the vehicle, including engine, power transmission, steering, brakes, and electrical systems. Included is training in the use of diagnostic and testing equipment and tools used in the repair process.¹⁸

Blueprint Reading

Classroom and practical experience concerned with visualizing, preparing, developing and interpreting blueprints. Included for study are the principles of sketching and drawing objects or structures, understanding and utilizing symbols, plans, sections and details for communicating through blueprints.¹⁹

Business Cooperative

Subject matter designed to make available to all pupils an introductory study of business, including (1) an understanding and appreciation of the nature, scope, and functions of the business-economic system in meeting consumer needs and wants; (2) an understanding of economic principles and

desirable business practices which should be followed by consumers in the wise handling of their business affairs; and (3) an understanding and appreciation of career opportunities which are to be found in business occupations. This course may have other titles, such as Introduction to Business or Basic Business. The subject matter of this course has value for all pupils as members of the economic community.²⁰

Business Education

Learning experiences of a very basic or general nature related to the field of business. Included are the basic skill areas of bookkeeping, shorthand, and typewriting.²¹

Carpentry

Classroom and shop experiences involving layout, fabrication, assembly, installation, and repair of structural units. Emphasized in instruction are the care and use of hand and power tools; equipment and materials; common systems of frame construction and the principles involved; and drafting, blueprint reading, applied mathematics, and materials estimating.²²

Child Care, Development and Guidance

Preparation for various kinds of employment related to child care centers and young children, e.g., assisting directors of child day-care centers, or nursery schools, assisting with activities on playgrounds and in recreation centers, and caring for children in homes and in such public places as stores, playgrounds, recreation centers, and transportation terminals.²³

Civil Technology

A planned program of classroom and laboratory experiences including the study of physical sciences, mathematics, surveying, strength of materials, and other specialty courses leading to preparation for designing, testing, and supervising the construction of highways, railroads, airports, bridges, harbors, irrigation works, sanitary plants, and other structures. The graduate works in direct support of the civil engineer.²⁴

Clothing and Textiles

The study of clothing and textiles, including the significance of these to the individual and family, and the nature, acquisition, and uses of textiles and clothing products. Planned experiences in the selection, construction, maintenance, and alteration of clothing and other textile products are usually provided.²⁵

COBOL

Is an abbreviation for Common Business Oriented Language which is a computer language that is common to many computers.²⁶

Commercial Art and Artist

Paste-Up

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to the design and execution of layouts and making illustrations for advertising, display, and instructional manuals. Instruction includes advertising theory and preparation of copy, lettering, poster design, fashion illustration, silk screen, air brush and touchup, inks and color dynamics, package and product design, drawings for line and halftone reproduction, and other display devices and exhibits. Instruction leads to preparation for various types of employment such as fashion illustrator, technical illustrator, interior decorator, and advertising artist.²⁷

Commercial Art Occupations

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to the design and execution of layouts and making illustrations for advertising, display, and instructional manuals. Instruction includes advertising theory and preparation of copy, lettering, poster design, fashion illustration, silk screen, air brush and touchup, inks and color dynamics, package and product design, drawings for line and halftone reproduction, and other display devices and exhibits.²⁸

Communication Technology

Specialized classroom and practical experiences concerned with the assembly, installation, operation, maintenance, and repair of communications equipment and systems of all types, e.g., industrial and entertainment sound

systems, data processing, telephone dial systems, two-way radio, central circuits, hearing aids, and high-fidelity receiving sets.²⁹

Comprehensive Home Economics

Instruction which derives content from a combination of the various areas of homemaking and emphasizes basic principles and interrelationships among these areas.³⁰

Consumer Education

The study concerned with the development of knowledge, understanding, appreciations and skills involved in the economic welfare of the consumer and consumer groups in everyday life.³¹

Cooperative Industrial Training

An activity in which pupils in occupational programs of study spend a portion of their time in supervised employment (i.e., in on-the-job training) in business or industry.³²

Cosmetology

Classroom and practical experiences concerned with a variety of beauty treatments, including the care and beautification of the hair, complexion, and hands. Instruction includes training in giving shampoos, rinses, and scalp treatments; hair styling, setting, cutting, dyeing, tinting, and bleaching; permanent waving; facials; and manicuring and hand and arm massaging. Bacteriology, anatomy, hygiene, sanitation, salon management (including keeping records), and customer relations are also emphasized. Instruction is designed to qualify pupils for the licensing examination.³³

Cycle, Marine, and Small Engine Repair

Classroom and shop experiences concerned with maintaining and repairing a variety of small engines used on portable power equipment, e.g., lawnmowers, outboard motorboats, chain saws, and rototillers. Instruction includes principles of internal-combustion engine operation, reading technical manuals, and customer relations.³⁴

Diesel Mechanic

Classroom and shop experiences which are concerned with all phases of repair work on diesel engines used to power buses, ships, trucks, railroad trains, electric generators, construction machinery, and similar equipment. Instruction and practice are provided in the diagnosis of malfunction; disassembly of engines and examination of parts; reconditioning and replacement of parts; repair and adjustment of parts; reconditioning and replacement of parts; repair and adjustment of fuel injection systems, oil and water pumps, generators, governors, auxiliary and accompanying power units, controls, and transmissions. The uses of technical manuals, a variety of hand and power tools, and testing and diagnostic equipment are also studied.³⁵

Distributive Education

Comprised of programs of occupational instruction in the field of distribution and marketing. This includes various combinations of subject matter and learning experiences related to the performance of activities that direct the flow of goods and services, including their appropriate utilization, from the producer to the consumer or user. These activities include selling, and such sales-supporting functions as buying, transporting, storing, promoting, financing, marketing research and management.³⁶

Drafting Occupations

Organized specialized learning experiences which emphasize theory, use of the drafting room, and laboratory and shopwork as each relates to gathering and translating data or specifications, including the aspects of planning, preparing, and interpreting mechanical, architectural, structural, pneumatic, marine, electrical/electronic, topographical, and other drawings and sketches. Instruction is designed to provide experiences in drawing; in the use of reproduction materials, equipment, and processes; the preparation of reports and data sheets for writing specifications; the development of plan and process charts and drawings; and the development of models. Instruction emphasizes the development of skills and knowledge essential for employment in ancillary capacities.³⁷

Economically Disadvantaged

Students from homes with four or more in the family that earn less than three thousand four hundred sixty dollars of annual income.³⁸

Electricity

Classroom and shop experiences concerned with the layout, assembly, installation, testing, and maintenance of electrical fixtures, apparatus, and wiring used in electrical systems. Instruction is provided in the reading, interpretation and understanding of residential, commercial, and industrial wiring based on controlling electrical codes.³⁹

Electronics Communications

Organized specialized learning experiences which include theory, laboratory, and shopwork as each relates to planning, producing, testing, assembling, and installing maintaining electronic communications equipment; and control devices. Emphasis is on solid-state devices and components, electron tube characteristics, low-frequency amplifiers, LC and RC oscillators, transistors, and amplitude and frequency modulation. Instruction is designed to develop knowledge, understanding, and skills essential for employment in communications, industrial electronics, radio/television, and other electronics occupations.⁴⁰

Engineering Related Technology

That part of the engineering field which requires the application of scientific and engineering knowledge and methods combined with technical skills necessary in the support of engineering activities. Persons prepared in this technology are a part of the engineering manpower team which includes the skilled craftsman, the technician and the engineer, and work as technicians in close support of the engineer.⁴¹

Family Living

The study of the nature, functions and significance of human relationships in the family. The subject matter includes concepts and principles.⁴²

Farm Mechanics

A combination of subject matter and activities designed to develop abilities necessary for assisting with and/or performing the common and important operations or processes concerned with the selection, operation, maintenance and use of agricultural power, agricultural machinery and equipment, structures and utilities, soil and water management, and

agricultural mechanics shop, including kindred sales and services.⁴³

Farm and Ranch Management

Planned learning activities which are concerned with farm resource analysis, accounting, production, financing, resource acquisition, purchasing, farm inputs, performance records, contracts, farm marketing and maintenance. The results of these learning activities are applied to formulating decisions involved in managing a farm or ranch operation.⁴⁴

Fluid Power

The study of hydraulics and pneumatics, including power conversion, transmission, and utilization in both stationary and mobile installations.⁴⁵

Foods and Nutritions

Organized subject matter and learning experiences related to the sales and sales-supporting tasks performed by distributive employees and management personnel in establishments serving prepared foods and drinks for consumption on their own premises or at a place designated by the customer.⁴⁶

Heavy Equipment Construction

Classroom and practical work experiences concerned with the operation, maintenance, and repair of heavy-duty equipment such as bulldozers, cranes, graders, tractors, concrete mixers, crawler-mounted shovels, trailer-mounted compressors, and the gasoline or diesel engines powering the equipment.⁴⁷

Home Health Aide

A combination of subject matter and experiences designed to prepare a person to assist the elderly, convalescent, or handicapped in their homes and to provide for their daily living needs which may be described as physical, mental, emotional, social and spiritual.⁴⁸

Horticulture

Organized subject matter and practical experiences concerned with the culture of plants used principally for ornamental or esthetic purposes. Instruction emphasizes knowledge and understanding important to establishing, maintaining, and managing ornamental horticulture enterprises.⁴⁹

Instrumentation Technology

A sequence of classroom and laboratory experiences, supported by physical sciences and mathematics, concerned with providing an understanding in the fields of electricity, electronics, mechanics, pneumatics, and hydraulics as they pertain to applications of the principles of control and recording systems and automated devices. The instructional program is planned to prepare the pupil to design, develop prototypes, and test and evaluate control systems or automated systems and to prepare graphs, written reports and test results in support of the professional personnel working in the field of instrumentation.⁵⁰

K-MUST

The Kansas Manpower Utilization System for Training is a management information system for vocational planners.⁵¹

Machine Tool Operation

Specialized classroom and shop experiences concerned with all aspects of shaping metal parts. Instruction involves making computations relating to work dimensions, tooling, feeds, and speeds of machining. Also emphasized are work on the bench, and on lathes, shapers, milling machines, grinders, and drills, the uses of precision measuring instruments such as layout tools, micrometers, and gages; methods of machining and heat treatments of various metals; blueprint reading; and the layout of machine parts. Instruction prepares the pupil to operate and repair all machines.⁵²

Marketing

Organized subject matter and learning experiences related to a variety of sales and sales-supporting tasks performed by distributive employees and management personnel engaged primarily in selling various types of merchandise at retail in department stores, junior department stores, variety stores, general merchandise stores, discount stores, and catalog houses.⁵³

Masonry

Specialized classroom and shop experiences concerned with the cutting, chipping, and fixing in position of concrete blocks, brick, and glass blocks using bonding materials and hand tools. Included is training in reading architectural plans, planning and estimating.⁵⁴

Medical Lab Assistant

A combination of subject matter and experiences organized to prepare a person to work under the supervision of medical technologists, clinical pathologists, or physicians to perform routine clinical laboratory procedures.⁵⁵

Mentally Handicapped

Pupils identified by professionally qualified personnel as having one or more mental handicaps, e.g., the educable mentally retarded, emotionally and socially maladjusted.⁵⁶

Metal Fabrication

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to the planning, manufacturing, assembling, testing, and repairing of parts, mechanisms, machines, and structures in which materials are cast, formed, shaped, molded, heat treated, cut, twisted, bent, pressed, stamped, fused, marked, or otherwise worked upon. Instruction emphasizes knowledge, skills, and understandings which lead to preparation for various types of skilled and semiskilled employment as well as helper-type jobs.⁵⁷

Millwork and Cabinetmaking

Specialized classes and practical work experiences concerned with mass production of products such as window frames, moldings, trim, and panels; and with making such products as furniture, store fixtures, kitchen cabinets, and office equipment. Instruction includes training in cutting, shaping, and assembling parts by means of hand tools and woodworking machines; refinishing furniture; installing hardware, e.g., hinges, catches, and drawer pulls; planning layouts; blueprint reading; drafting; and features of various kinds of woods.⁵⁸

Minority Groups

These figures are based on updated 1970 Census data which includes only the non-white population by counties.⁵⁹

Nurse Assistant

A combination of subject matter and experiences designed to prepare a person to perform functions and follow procedures concerned with diagnosis

and treatment of patients in a physician's office. Instruction includes physical examinations, laboratory tests, x-rays, measurements, and medications.⁶⁰

Office Education

This body of subject matter, or combination of courses and practical experience, is organized into programs of instruction to provide opportunities for students to prepare for or advance in selected office occupations. Learning experiences are designed to lead to employment and/or advancement of individuals in occupations of public or private enterprise or organizations related to the facilitation function of the office.⁶¹

Office Machines

Programs concerned with operations and procedures utilizing office machines for billing, posting, calculating, adding, listing, and mechanizing data.⁶²

Photography Commercial

Organized specialized learning experiences which include theory, laboratory, and studio work as each relates to all phases of camera uses and photographic processing. Instruction includes composition and color dynamics, contact printing, and enlarging; developing film; air brush and cameras, meters and other photographic equipment; portrait, commercial, and industrial photography; and processes such as microfilming and preparing copy for other printing and graphic arts processing.⁶³

Physically Handicapped

Pupils identified by professional qualified personnel as having one or more physical handicaps, e.g., the blind, the hard of hearing, the speech impaired, and the crippled.⁶⁴

Police Science

A planned sequence of classroom instruction and laboratory experiences designed to prepare a student to function as one or more of the following: (1) a generalist in any law enforcement agency concerned with patrol and investigative activities, traffic control, initial contact with the public such as obtaining information, preparing reports, and testifying in court;

(2) an evidence technician operating in a crime laboratory or mobile unit concerned with the collection preparation, and transportation of physical evidence--including the use of skills in photography and report writing; and (3) a technician--primarily concerned with delinquency or crime prevention--who may be employed by a police agency, juvenile court, or correctional institution to (a) carry out responsibilities which may include investigation and referral of dependent-neglected children as well as delinquents and youthful offenders, (b) supervise persons on probation, or (c) provide rehabilitative services to offenders.⁶⁵

Practical Nurse

A combination of subject matter and supervised clinical experiences designed to prepare a person to give direct nursing care under the supervision of a nurse or physician.⁶⁶

Printing Graphic Arts

Organized, specialized learning experiences which include theory laboratory, and shopwork as they relate to all phases of hot and cold type-setting, layout, composition, presswork, and binding, including flexography, lithography, photoengraving, and other graphic arts related to the printing industry. Emphasis is on typographical layouts and design, hand and machine typesetting, camera and plate work, imposition typesetting, offset and platen press makeup and operation, papercutting, ink and color preparation, binding, and production by silk screen process.⁶⁷

Program

The uniqueness of a course of occupational study at a specific school; i.e., all classes offered at any Kansas area vocational-technical school for the training of welders.

Program Type

Occupational training generalized to describe similar programs of study at all schools used in this study; i.e., the welding programs at all the Kansas area vocational-technical schools.

Radio-Television

Specialized theory and practice which are concerned with the construction, maintenance, and repair of radios and television sets. Training also prepares students to diagnose troubles and make repairs on other electronic products such as high-fidelity sound equipment, phonographs, and tape recorders.⁶⁸

Vocational Education

Vocational or technical training or retraining which is given in schools or classes under public supervision and control or under contract with the state board. This education is conducted to prepare individuals for gainful employment as semi-skilled or skilled workers or technicians or subprofessionals in recognized occupations and in new and emerging occupations or to prepare individuals for enrollment in advanced technical education programs.⁶⁹

Welding

Specialized classroom and shop experiences concerned with all types of metal welding, brazing, and flame cutting. Instruction emphasizes properties of metals, blueprint reading, electrical principles, welding symbols, and mechanical drawing.⁷⁰

FOOTNOTES

¹U.S. Riot Commission, Report of the National Advisory Commission on Civil Disorders (New York: The New York Times Company, 1968), p. 278.

²Ibid., p. 253.

³Statement by R. B. Daniels, State Supervisor of Industrial Education, personal interview, June 14, 1972.

⁴Statement by Dale Brooks, President of Area Vocational-Technical School Administrators Association, personal interview, June 21, 1972.

⁵U.S. Department of Labor, Manpower Report of the President, Transmitted to Congress, April, 1971 (Washington: Government Printing Office, 1971), p. 48.

⁶United States Statutes at Large, 90th Congress, 2D Session, 1968, Vol. 82 Public Law 90-576 (Washington: Government Printing Office, 1968), pp. 1064-1098.

⁷Statement by Wilbur Rawson, State Supervisor for Exemplary and Special Needs, personal interview, June 14, 1972.

⁸Robert E. Scott, James L. Harris et. al., Kansas Manpower Utilization System for Training, Cycle II Report, Division of Vocational Education, Kansas Department of Education (Manhattan, Kansas: Kansas State University Press, January, 1973), p. 3.

⁹U.S., Department of Health, Education and Welfare, Standard Terminology for Curriculum and Instruction in Local and State School Systems, Ed. John F. Putnam and W. Dale Chismore (Washington: Government Printing Office, 1970), p. 157.

¹⁰U.S., Department of Health, Education and Welfare, Department of Labor, Vocational Education and Occupations (Washington: Government Printing Office, 1969), p. 58.

¹¹Ibid., p. 64.

¹²Ibid., p. 91.

¹³Ibid., p. 107.

¹⁴Ibid., p. 105.

¹⁵Kansas, Statutes Annotated, Chapter 72, Article 44, Paragraph 4412 (Topeka: Kansas State Printer, 1972), p. 144.

- ¹⁶Ibid.
- ¹⁷U.S., Vocational Education and Occupations, op. cit., p. 106.
- ¹⁸Ibid.
- ¹⁹Ibid., p. 230.
- ²⁰U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 231.
- ²¹Ibid., p. 166.
- ²²U.S., Vocational Education and Occupations, op. cit., p. 115.
- ²³Ibid., p. 54.
- ²⁴Ibid., p. 230.
- ²⁵Ibid., p. 52.
- ²⁶Nancy B. Stern and Robert A. Stern, Cobol Programming (New York: John Wiley and Son, Inc., 1970), p. 6.
- ²⁷Standard Terminology for Curriculum, op. cit., p. 88.
- ²⁸Ibid., p. 110.
- ²⁹Ibid., p. 130.
- ³⁰Ibid., p. 219.
- ³¹Ibid., p. 194.
- ³²U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 259.
- ³³U.S., Vocational Education and Occupations, op. cit., p. 164.
- ³⁴Ibid., p. 171.
- ³⁵Ibid., p. 125.
- ³⁶Ibid., p. 19.
- ³⁷Ibid., p. 125.
- ³⁸Robert E. Scott, op. cit., p. 86.
- ³⁹Ibid., p. 116.
- ⁴⁰Ibid., p. 130.

- ⁴¹Ibid., p. 86.
- ⁴²Ibid., p. 194.
- ⁴³Ibid., p. 8.
- ⁴⁴Ibid., p. 6.
- ⁴⁵U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 199.
- ⁴⁶U.S., Vocational Education and Occupations, op. cit., p. 24.
- ⁴⁷Ibid., p. 117.
- ⁴⁸Ibid., p. 194.
- ⁴⁹Ibid., p. 12.
- ⁵⁰Ibid., p. 92.
- ⁵¹Robert E. Scott, et. al., op. cit., p. 3.
- ⁵²Ibid., p. 149.
- ⁵³Ibid., p. 25.
- ⁵⁴Ibid., p. 231.
- ⁵⁵Ibid., p. 185.
- ⁵⁶Robert E. Scott, et. al., p. 86.
- ⁵⁷Ibid., p. 147.
- ⁵⁸Ibid., p. 193.
- ⁵⁹Robert E. Scott, et. al., p. 86.
- ⁶⁰Ibid., p. 49.
- ⁶¹Ibid., p. 57.
- ⁶²U.S., Standard Terminology for Curriculum and Instruction in Local and State School Systems, op. cit., p. 214.
- ⁶³U.S., Vocational Education and Occupations, op. cit., p. 56.
- ⁶⁴Robert E. Scott, et. al., p. 86.
- ⁶⁵Ibid., p. 100.

⁶⁶U.S., Vocational Education and Occupations, op. cit., p. 42.

⁶⁷Ibid., p. 137.

⁶⁸Ibid., p. 133.

⁶⁹Kansas, Statutes Annotated, op. cit., p. 145.

⁷⁰U.S., Vocational Education and Occupations, op. cit., p. 157.

Chapter 27

BACKGROUND AND REVIEW OF LITERATURE

INTRODUCTION

This chapter is concerned with background literature that identifies, explains or expands key concepts used in this study. The disadvantaged students and handicapped students will be studied as separate groups rather than as a combination of both in order to better understand their characteristics. Therefore, this chapter was divided into ten parts:

- (1) Introduction;
- (2) The Kansas student accounting system;
- (3) The academically disadvantaged;
- (4) Minority groups;
- (5) The economically disadvantaged;
- (6) The mentally handicapped;
- (7) The physically handicapped;
- (8) Vocational Education;
- (9) Kansas area vocational and technical schools; and
- (10) The summary

THE KANSAS STUDENT ACCOUNTING SYSTEM¹

In the winter of 1971-72, the Division of Vocational Education of the Kansas State Department of Education identified a need for a new automated method of gathering and processing data on all students enrolled in vocational or technical education across the state. The task of developing this system was assigned to the K-MUST Project.

The purpose of this system was to gather data on each student indicating whether or not the student was (1) from a minority group, (2) academically disadvantaged, (3) economically disadvantaged, (4) mentally handicapped, and/or (5) physically handicapped. A second phase of the system, commonly called the completion phase, was designed to determine whether or not

students had completed their training and if they had not, to determine why they had not. A third phase, commonly called the follow-up phase, was designed to determine if the student had received employment related to his training after completion. Students in the fourteen area vocational and technical schools and their satellite programs were selected to serve as a pilot group to test the system. This study was based in part on the data collected from this pilot test.

The system can logically be segmented into 19 operational steps (see Figure 10). These operational steps are briefly explained below.

The first step in the system is to familiarize teachers with the system through inservice training. A handbook was developed and given to teachers in a series of training sessions. This handbook contains all codes and definitions necessary to complete systems source documents.

The second step in the system is to disseminate enrollment forms to the teachers. At the annual summer conference (1972-73 school year), vocational teachers from the area schools received one enrollment form for each student in their vocational or technical programs. The enrollment form is in an optical scan format and gathers student characteristics data needed for decision making relative to vocational and technical program offerings. Figure 11 is a pictorial representation of the form.

In September of 1972, the area school teachers assisted their students in completing the optical scan form. This action constituted step three in the system.

The fourth step is for the teacher to answer the questions in section 15 on the form for each of his students. This section refers to disadvantaged and handicapped students. (Note: The student identifies himself as to ethnic group in section 2 on the form).

The fifth step is to send the forms to Kansas State Teacher's College at Emporia where the data is transferred from the scan sheets to computer tape by an IBM Opscan 100 DM. This scanner is of the new double density generation and can process over 600 forms a minute.

Step six is a hand operation in which the K-MUST staff visually inspects an output listing of the source data and inputs corrections for the master tape. The output listing has flags associated with computer detected errors in the source data.

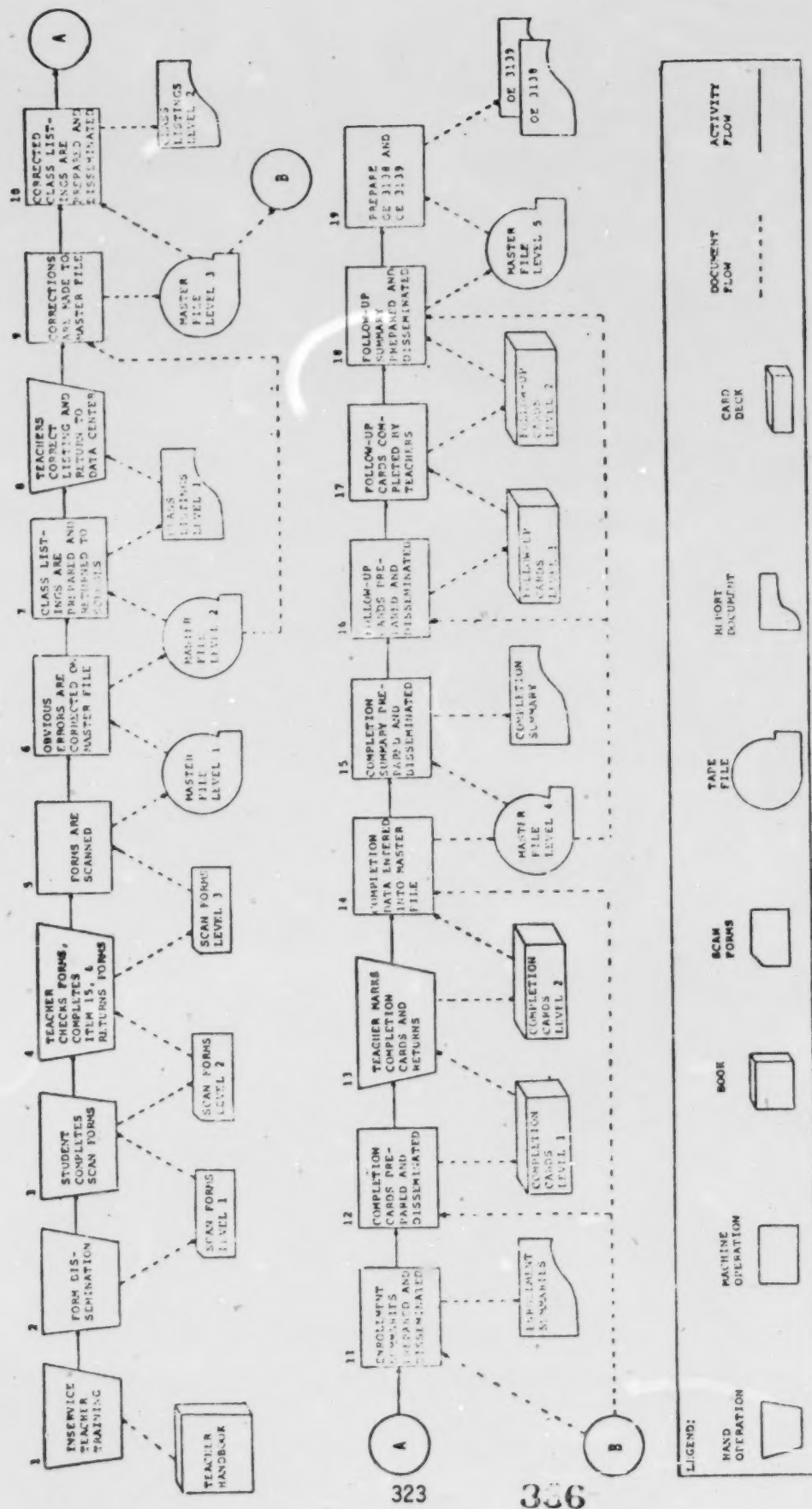


Figure 10 Student Accounting System Flow Chart

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Once the obvious errors in the master file have been corrected, class listings are prepared and sent to teachers. This constitutes step seven of the system.

Step eight requires the teachers to examine the class listing and pencil in necessary changes. The corrected listings are returned to the K-MUST Project staff.

In step nine of the system, the K-MUST staff enters the corrections from the listings onto the master tape. It is at this point that the data for this study were retrieved.

In step 10, corrected class listings are prepared and disseminated to the schools. This serves as an official class roster.

An enrollment summary of all programs is prepared for state supervisors in step 11. This enrollment summary may be prepared in six different ways, i.e., by school by program; by school by occupational objective; by occupational objective by school; by occupational objective by program; by program by school and by program by occupational objective.

In step 12, completion cards are prepared and distributed. Figure 12 is a pictorial representation of a completion card.

In step 13, the teacher marks a completion card for each student in his class. The teacher marks the card by selecting one of ten options which best describes the status of the student relative to the program.

The completion card data is entered into the master file in step 14. Prior to entry, the completion cards are hand sorted into groups depending on response and a lead card for each group prefaces that group as an identifier.

In step 15, completion summary reports can be of six types as were the enrollment reports described in step 11.

In step 16, follow-up cards are prepared and disseminated. Figure 13 is a pictorial representation of a follow-up card. As with the completion card, the student name, program name, school name and student identification number are prepunched into the card from the master tape.

Step 17 requires the teachers to complete a follow-up card only for those completed or marketable skilled students and return the cards to the K-MUST staff. There are twenty possible responses on the follow-up card and the teacher must select that response or series of responses which best represent the status of the student.

WAS, ACCORDING TO OUR RECORDS, ENROLLED IN YOUR TRAINING PROGRAM. DID HE/SHE: (CHECK THE MOST APPROPRIATE RESPONSE AND COMPLETE BLANKS)

☐ 1. COMPLETE PROGRAM AND LEFT SCHOOL?	TOTAL HOURS COMPLETED IN THIS PROGRAM THIS YEAR _____
☐ 2. COMPLETE PROGRAM; TAKING OTHER COURSE WORK?	
☐ 3. COMPLETE THIS YEAR OF PROGRAM; WILL CONTINUE PROGRAM?	TOTAL HOURS COMPLETED IN THIS PROGRAM TO DATE _____
☐ 4. TRANSFER: IN SIMILAR PROGRAM AT NEW SCHOOL?	
☐ 5. TRANSFER: NOT IN PROGRAM AT NEW SCHOOL?	ANNUAL EARNINGS FOR CO-OP STUDENT _____
☐ 6. DROP PROGRAM; CONTINUED IN SCHOOL?	
☐ 7. DROP SCHOOLING; FULL TIME EMPLOYMENT IN TRAINING OR RELATED FIELD?	TOTAL HOURS WORKED IN CO-OP PROGRAM _____
☐ 8. DROP SCHOOLING; NOT EMPLOYED IN TRAINING FIELD?	
☐ 9. DROP OR TRANSFER; STATUS NOT KNOWN	
☐ 10. NOT IN MY PROGRAM THIS YEAR	
☐ 11. DECEASED OR DISABLED	

Figure 12 Completion Card

WAS, ACCORDING TO OUR RECORDS, COMPLETED YOUR TRAINING PROGRAM DURING THE OVERPRINTED YEAR. PLEASE CHECK THE ONE MOST APPROPRIATE RESPONSE INDICATING HIS WORK STATUS AND THE ONE MOST APPROPRIATE RESPONSE INDICATING HIS SCHOOL STATUS AS OF OCTOBER 1 OR MAY 1 OF THIS YEAR. (WHICHEVER IS APPROPRIATE). IF THE STUDENT IS WORKING EITHER IN AN OCCUPATION FOR WHICH HE WAS TRAINED OR IN AN OCCUPATION RELATED TO HIS TRAINING, COMPLETE PART 3 OF THIS CARD; OTHERWISE LEAVE PART 3 BLANK.

(PART 1) WORK STATUS	(PART 2) SCHOOL STATUS
☐ 1. IN ARMED FORCES	☐ 1. IN SCHOOL IN FIELD RELATED TO TRAINING (FULL TIME)
☐ 2. IN SCHOOL, NOT WORKING	☐ 2. IN SCHOOL IN FIELD NOT RELATED TO TRAINING (FULL TIME)
☐ 3. NOT IN LABOR FORCE (MARRIAGE, ETC)	☐ 3. IN SCHOOL IN FIELD RELATED TO TRAINING (PART TIME)
☐ 4. NOT IN LABOR FORCE (DISABLED OR DECEASED)	☐ 4. IN SCHOOL IN FIELD NOT RELATED TO TRAINING (PART TIME)
☐ 5. WORKING IN OCCUPATION FOR WHICH TRAINED (FULL TIME)	☐ 5. IN SCHOOL IN VOCATIONAL OR TECHNICAL TEACHING TRAINING
☐ 6. WORKING IN OCCUPATION RELATED TO TRAINING (FULL TIME)	☐ 6. NOT IN SCHOOL
☐ 7. WORKING IN NON RELATED OCCUPATION (FULL TIME)	
☐ 8. WORKING IN OCCUPATION FOR WHICH TRAINED (PART TIME)	
☐ 9. WORKING IN RELATED OCCUPATION (PART TIME)	
☐ 10. WORKING IN NON RELATED OCCUPATION (PART TIME)	
☐ 11. UNEMPLOYED, SEEKING EMPLOYMENT	
☐ 12. STATUS OF STUDENT UNKNOWN	
☐ 13. RECORD IN ERROR, STUDENT NOT IN CLASS	

(PART 3) ADDITIONAL INFORMATION
1. STUDENT'S JOB TITLE _____
2. STUDENT'S ANNUAL SALARY _____
3. FIRM EMPLOYING STUDENT _____
4. CITY WHERE FIRM IS LOCATED _____
5. PHONE NUMBER OF FIRM _____

Figure 13 Follow-Up Card

In step 18, a follow-up summary is prepared and disseminated. Again, this summary can be of six types similar to those available in enrollment and completion reports.

In the final step, federal reports are prepared from the data on the master tape. There are two principle federal reports, i.e., OE 3138 which is an enrollment report and OE 3139 which is a completion and follow-up report.

THE ACADEMICALLY DISADVANTAGED

Fifteen participants in an Institute for Advanced Study who met at the Institute for Language Disorders, Northwestern University, in 1967 agreed on a definition in order to clarify learning disabilities for the educator.

Learning disability refers to one or more significant deficits in essential learning procedures requiring special education techniques for remediation.

Students with learning disability generally demonstrate a discrepancy between expected and actual achievement in one or more areas, such as spoken, read, or written language, mathematics, and spatial orientation.

The learning disability referred to is not primarily the result of sensory, motor, intellectual, or emotional handicap, or lack of opportunity to learn.

Significant deficits are defined in terms of accepted diagnostic procedures in education and psychology.

Essential learning processes are those currently referred to in behavioral science as involving perception, integration, and expression either verbal or nonverbal.

Special education techniques for remediation refers to educational planning based on the diagnostic procedures and results.

The above findings were pointed out in Kass Review of Educational research.²

More recently, learning disabilities were defined by the United States Congress.

The term 'children with specific learning disabilities' means those children who have a disorder of one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations. Such disorders include such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such a term does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, of mental retardation, of emotional disturbance, or of environmental disadvantage.³

Michal-Smith and Morgenstern used the following definition of learning disability.

A learning disability refers to a significant difference between a child's actual achievement level and his functioning capacity based on his mental abilities. Characteristically, a learning disability persists and fails to yield to repetition of routine instruction or retention in the grades . . . Children with learning difficulties do not represent a homogeneous group in terms of etiology or areas of deficiency.

The one factor students with learning disabilities have in common is that they are underachievers; they have little else in common.⁴

Goldberg, in a summary portrait of the academically disadvantaged pupil, revealed that they usually come from a disadvantaged home. Because of his home, the child is not able to produce academic learning either intellectually or attitudinally.⁵

The verbal and written communication skills of the academically disadvantaged student are restrictive only if related to skills required for success outside of his environment. By law, in the United States, the academically disadvantaged student moves into a totally new environment, the public school system. The concepts of education in the public school system are easily adopted by the middle and upper-class student but represent a threat to the academically disadvantaged student.

The academically disadvantaged student has a communicative deficiency, which is detrimental to his assimilation into the middle-class society. The child learns the communication pattern of persons with whom it is important to communicate.

When inadequate emphasis is placed on words as a means of enhancing interpersonal relationships or achieving comprehension of his environment or other kinds of gratifications, the student's development of verbal facility is diminished.⁶

Ausubell stated that in the area of language development, and particularly with respect to the abstract dimension of verbal functioning, the deprived student manifested the greatest degree of intellectual retardation.⁷ Language development in terms of the degree to which a person can relate to a larger segment of society is necessary.

Underprivileged students are capable of utilizing language in a rich and free fashion, have well-developed, nonverbal ways of communicating, but are sorely lacking in advanced linguistic form.⁸

There is no reason to believe that sensory deprivation is a factor in the deficiencies of lower-class students. Sensory deprivation is largely

irrelevant to cultural deprivation, which has to do with what the student has learned rather than with the amount of stimulation. Thus, seemingly the difficulty is with the manner in which a student interacts with his environment rather than paucity of his environment.⁹ Students from the ghettos tend to have poorer and less systematic ordering of stimulation sequences, thereby being less useful to the growth and the activation of cognitive potential.¹⁰

According to Kopp:

Children brought up in simple cultural-social settings may fail to receive training in the complex sequencing underlying memory span or in the retention of complex combinations of sensory variables. Their environment and, specifically, their perceptual experiences do not provide sufficient opportunity for the development of the speed and accuracy of discrimination of complex stimuli or for practice in the rapid retrieval and integration of stored information. Their experience in linguistic interaction may be limited to simple response forms because of the lack of variety and complexity in their social relations.¹¹

MINORITY GROUPS

Obtaining equality of educational opportunity by American citizens, be they black, white, red or brown is not an isolated problem. It is only one aspect of the larger mandate of assuring all citizens the opportunity of participating equally in the pursuit of the "good life." The attempt, therefore, to secure equality of educational opportunity to enjoy on the same basis the rights and privileges available to all citizens, regardless of race, color, sex, class, religion, or national origin is essential.

Johnson in his book, Teaching the Culturally Disadvantaged, gives a relationship to the minority groups and the culturally disadvantaged.

Disadvantaged pupils are more like all other pupils than they are different because they have the same basic needs--they have the same basic physical needs, the same basic emotional needs, and the same basic psychological needs. The satisfaction of their basic needs is frustrated by cultural deprivation. The School is the primary agency of society to compensate for the deprivation that these children suffer. To be successful in helping disadvantaged pupils, the school has to learn what it can and what it cannot do--what is possible--along with appropriate and effective methods.¹²

The similarities of the disadvantaged were further pointed out by Johnson:

Minority group and culturally disadvantaged are not synonymous. However, there is a relationship; one's chances of being culturally disadvantaged are increased if one is a member of a minority group. While minorities, as groups, have not yet achieved their rights of full participation in American Society, many of them are moving closer to this goal. We are concerned here, however, with those minority individuals who are standing still and even may be moving backward.¹³

Most educators accept the term "culturally disadvantaged," when referring to minority groups, poor Caucasians, rural and inter-city dwellers.¹⁴

Fishmen in giving guidelines for testing minority groups gave this definition:

The term 'minority group' as we are using it here is not primarily a quantitative designation. Rather it is a status designation referring to cultural or social disadvantage. Since many Negro, Indian, lower-class white, and immigrant children have not had most of the usual middle-class opportunities to grow up in home, neighborhood, and school environments that might enable them to utilize their ability and personality potentials fully, they are at a disadvantage in school, and in after-school and out-of-school situations as well. It is because of these disadvantages, reflecting environmental deprivations and experiential atypicalities, that¹⁵ certain children may be referred to as minority group children.

Limitations of the black man's achievement or lack of achievement of equality is well known. According to the late President John F. Kennedy, in his message to Congress, a black child born in America, regardless of the section in which he was born, has about half as much chance of completing high school as a white child, one third as much chance of completing college, one third as much chance of becoming a professional man, one seventh as much chance of earning \$10,000 a year, a life expectancy which was seven years shorter, with prospects of earning only half as much during his lifetime. He might have added that the same black child was two and one-half times as likely to have come from a broken home in a slum-ridden ghetto; four times as likely to have been a member of a family existing on welfare; three and one-half times as likely of running afoul of the law.¹⁶

Despite all the concern and all the literature published, few people know or understand the nature and history of the abnormal role which the blacks have played in American society for the past four centuries and the influence this has had on his present status. As pointed out in the Report of the National Advisory Commission on Civil Disorders:

Few appreciate how central the problem of the Negro has been to our social policy. Fewer still understand that today's problem can be solved only if white Americans comprehend the rigid social, economic and educational barriers that have prevented Negroes from participating in the main stream of American life.¹⁷

There is widespread consensus that public education in the United States should provide equality of educational opportunity. But according to Thelen, there is considerable disagreement as to what "equal" educational opportunity means, or should mean.¹⁸ A. F. Kleinberger asked,

What does equality of educational opportunity mean? Does it mean the same opportunity to get an education? Or does it mean an opportunity to get the same education? Or opportunity to be educated up to the level of one's capabilities and future occupational prospects? Or opportunity to learn whatever one needs to develop one's own peculiar potentialities? In the case of the 'culturally-deprived,' whose background has built-in resistance to learning . . . does equal educational opportunity mean compensatory education? Is only racially integrated education equal, irrespective of whether lack of integration is intentional or accidental? Is equality of educational opportunity a moral as well as mathematical concept?¹⁹

The purpose here is not to engage in an extended discussion of the various definitions of this concept, but rather to suggest that a very important aspect of the problem of race and equality of educational opportunity is the question found in the meaning of the concept of equality. It is illuminating, as well as illustrative, to note briefly the definitions of equality, or rather inequality, as employed in the Coleman survey.²⁰

In planning the survey, Coleman observed that "it was obvious that no single concept of equality of educational opportunity existed and that the survey must give information relative to a variety of concepts." The first type of equality was defined in terms of the community's "input" to the school, such as per capita expenditure and equality of school plant, library, teachers, and other similar items. A second was defined in terms of racial composition, in view of the court's pronouncement that separate schools were inherently unequal. A third type included various intangibles such as teacher morale, teacher expectations of students, level of interest of the student body in learning and other related aspects of the learning climate.²¹

All three of these definitions involved "input" of resources to the school; a second set involved the "effects of schooling." Thus a fourth type of equality was defined in terms of the effects of the school on "individuals with equal backgrounds and abilities." Here, Coleman explained,

equality comprised equal results, given the same individual input. A fifth type was defined in terms of the effects of the school on individuals of unequal backgrounds and abilities. In this instance, equality consisted of equal results given different individual inputs.²²

In stressing the difference between inputs and effects, the Coleman survey made explicit the basis upon which concepts of equality of educational opportunity have been predicated in general, namely, effective equality of opportunity; that is, equality of those elements that are effective for learning.²³

There is, to be sure, no easy way of describing the corresponding approach to whites and white institutions of these advocates of black pride. Malcolm X speaks about the White Devil in prose that approaches a mania on the subject, while Stokely Carmichael states that he is disinterested in whites.

Prior to the release of Racial Isolation in the Schools and shortly after the publication of the Coleman Report, Stokely Carmichael offered an explanation of Black Power that continues to dominate and guide a small, but vocal and extremely influential group of Negroes. Carmichael stated that

politically, black power means . . . the coming together of black people to elect representatives and to force those representatives to speak to their needs. It does not mean merely putting black faces in office . . . The power must be that of a community, and emanate from there . . .²⁴

The description that Stokely Carmichael gives of integration, notably school integration, is especially relevant to an understanding of the specific approach many blacks have toward their school system. It is also germane to an understanding of the role of black studies. Carmichael's comments on integration are directed toward integration conceived as assimilation.

Integration, moreover, speaks to the problem of blackness in a despicable way. As a goal, it has been based on complete acceptance of the fact that in order to have a decent house or education, blacks must move into a white neighborhood or send their children to a white school. This reinforces among both black and white, the idea that 'white' is automatically better and 'black' is by definition inferior. This is why integration is a subterfuge for the maintenance of white supremacy. It allows the nation to focus on a handful of Southern children who get into white schools, at great price, and to ignore the 94 percent who are left behind in unimproved all-black schools. Such situations will not change until black people have power--to control their own school boards, in this case.²⁵

In the western part of the United States, especially in California, New Mexico, Texas, Colorado, and Arizona are many Mexican-Americans who live in shacks, wear ragged clothing and, for the sake of a feeling of identity, cling to the culture of Mexico. Some of these people have lived in slum conditions many years. They also tend to have large families. They often move from town to town in pursuit of work, thereby breaking any continuity of schooling for their youngsters. Usually their socialization includes few individuals outside their own group. As a result, they are likely to be isolated from the rest of the community. These people usually live in slum areas of cities in unsanitary conditions where children contract many diseases. Their education is interrupted by hunger and constant moving with the result that school progress is slow, and retardation is the usual outcome. The Mexican-American youngster is further disadvantaged by a bicultural background, which encompasses a foreign language, plus geographical proximity to the country of origin.²⁶

The Puerto Rican population in the United States also possesses a foreign-language barrier and geographic proximity to the native land. Crow reports the following on Puerto Ricans:

Sixteen percent of New York City's population is Puerto Rican. Puerto Ricans are a proud people who try to take care of themselves. In Chicago, for example, most of them are self-supporting. Since they are citizens of the United States, they are not faced with the problem of becoming naturalized, as are the Mexicans. The language spoken by Puerto Ricans is Spanish. This adds to his adjustment problem in coping with school and communication with his peers.²⁷

In theory, society can change the conditions of racial inequality in our schools and achieve equal educational opportunity for all races. For this reason the inequities within our present vocational schools pertaining to participation rate of the non-white will be identified and investigated.

THE ECONOMICALLY DISADVANTAGED

A student's self-concept is learned. His perceptions of his environment are filtered through his ideas about himself. Self-concept influences the way the student perceives his abilities, his status, and his roles.²⁸ Research on economic development of deprived students has been very extensive. The available evidence, however, does seem to indicate that the ego development

of the deprived student is more likely to be characterized by lack of self-confidence and negative self-image than that of the middle-class student.²⁹

Poverty contributes to this failure syndrome also. The poor lack money to buy adequate food, shelter, or clothing. "Minimal physical comfort and security are denied them. Most poor students live in tenements, shacks, ramshackle apartments, or in single homes with peeling paint on unpaved streets."³⁰ Poverty, however, has a more subtle dimension. To be poor is to be stigmatized by our society.

A man's worth is determined by how much money he has, the car he drives, his address, his clothes, and his ability to spend. Lacking financial worth, he lacks personal worth. Moreover, he is all too willing to accept society's value definitions and consider himself a failure. He feels impotent, he believes there is little he can do about his destiny.³¹

Poverty is a state of being in serious need and is relative to the individual's personal judgment of himself. One criterion currently used by our government is \$3,670 as a minimum level for family income. However, an individual or a family able to reach only a minimum level of well-being may still be impoverished.³²

Other variables associated with failure or the economically disadvantaged student are lack of communicative skills and ineffective systematic ordering of stimulation sequences.³³ Bereiter and Engelmann found the following to be true:

Sensory deprivation has nothing to do with the educational quality of the stimuli available, but only with their variety, intensity, and patterning. On these purely quantitative bases automobiles passing in the street are as good as story books, old shoes as good as dolls, and trash cans are as good as toy drums.³⁴

The environment of the economically disadvantaged student is as rich in concrete symbols and images as the environment of the middle-class child. Because of the barren image of the suburban housing development with mass reproduction of homes, yards, shrubs, and streets, the disadvantaged environment, while chaotic, perhaps offers more for the student to see.

The students from economically disadvantaged cultures usually have different codes of behavior.³⁵ Causes for differences in behavior were cited by the educational policies commission as follows:

The educative process is greatly complicated for the child whose home is characterized by poverty, disease, instability or conflict,

Such homes tend to produce children who are tired, hungry, ill, and emotionally unstable. Violence is their best weapon and often their only defense.³⁶

George Henderson in an effort to answer the question, "Who are the disadvantaged?" stated that, "most authors agree that children of low-income parents tend to be overrepresented in the ranks of those who do not receive a fair or an equal share of the educational opportunities."³⁷ Henderson also quoted the National Educational Association's Educational Policies Commission definition of the typical disadvantaged child.

First, the disadvantaged child is likely to be very poor. Persons whose cultures keep them apart from the mainstream of American life find the gravest difficulties in employment, partly because they tend to lack . . . the job skills which would enable them to acquire the increasingly difficult job skills of an intellect-based economy. But for a significant group among the disadvantaged, there is a still worse handicap: the persistence of racial prejudice in employment.³⁸

William Amos agreed by admitting that, "the most universal, the most massive, the one shared by most, is undoubtedly socioeconomic."³⁹

Kaplan asserted that, "culturally disadvantaged youth--and by this we usually mean poverty stricken youth--are the subject of growing interest among the nation's educators."⁴⁰ He also contributed to what others have said:

Whether we choose to call these pupils disadvantaged, culturally deprived, or economically impoverished, they usually exhibit two characteristics: they are from the lower socioeconomic groups in the community and they are notably deficient in cultural and academic strengths. The latter characteristic is usually, but not always, a consequence of the first factor. The parents of these children have simply been unable to provide the quality of background, outlook, initial grounding, and readiness for formal learning that middle and upperclass parents provide as a matter of course. And all too often our schools have been almost exclusively geared to the mores of the latter group.⁴¹

Riessman also described some behaviors that alienate the disadvantaged student to the school situation.

They were relatively slow at cognitive tasks and often appeared to be anti-intellectual. Often the child was traditional and superstitious which caused him to be inflexible and not open to reason about many of his beliefs. He felt alienated from the larger social structure and held others to blame for his misfortunes. Masculine activities were virtuous but intellectual activities were unmasculine. Vocational knowledge was appreciated but knowledge for its own sake was rarely valued.⁴²

Relating a typically middle-class oriented classroom to a student who grows up in an atmosphere of tension, economic insecurity, and despair is difficult. Learning about middle-class values and conditions is difficult for a child who knows poor sanitary conditions, poor housing, broken homes, promiscuity, drinking, crime, and utter defeatism.⁴³

One basic element of the economically disadvantaged student's environmental plight is the housing code, about which Schorr made this comment:

If the housing code could be enforced then the rooms might be made livable with heat, repaired plumbing, rat control, and general repair. However, one cannot review the problems of code enforcement and the solutions that are proposed without concluding that they are superficial, if not grave symptoms of a deeper maladjustment. The hard fact is that profitmaking incentives run counter--so far as the maintenance of housing is concerned--to the best interests of the poor.⁴⁴

Urban renewal, thought by many to hold the key for slum clearance, is also causing problems.

A study in Chicago indicated that among non-white families earning less than three thousand dollars a year, median rent rose from thirty-five percent of income before relocation to forty-six percent afterward.

Disenchantment because of empty promises trickles down from the adult into the student's concept of government. With no real answer in sight, the community of the economically disadvantaged student remains an image of deterioration. Trubowitz said:

In the cities, age has made buildings, which were once adequate, into run-down structures unfit for living. Costs of repair leave the buildings with sagging roofs, broken windows, dirty, and structurally dangerous because of overcrowding.⁴⁵

Overcrowding naturally causes the additional problem of sanitation, as the ghetto community is typified by trash, garbage, and other waste products visible on the streets and sidewalks. Within the individual living units of the economically disadvantaged student, there is a sparsity of furniture and household items.

Fantini assisted in identifying where the economically disadvantaged students exist.

Although we tend to think first of such districts as Harlem, the disadvantaged are to be found also in small towns, in the rural slums of backwoods Appalachia, in the Spanish barrios of El Paso, on American Indian reservations, or on the fashionable streets of Scarsdale.⁴⁶

As mentioned earlier, since being economically disadvantaged is relative, economic stability or social status does not guarantee that a student will be "advantaged." The Educational Policies Commission made this comment:

Today, as the technological revolution continues to transform America, the prerequisites for a constructive and independent life are constantly raised. This inadaptability is most widespread in those areas of the United States that are technologically least developed, and most conspicuous among those who migrate from such areas to the cities.⁴⁷

Urban centers seem to attract economically disadvantaged people even though many problems exist there.

Geographical isolation and class structure tended to confirm the ignorance and inertia of these disadvantaged Americans, denying them the opportunity and discouraging the will to express or alleviate their ills. Yet, until recently they were able at least to pursue their accustomed modes of life, because they lived in uncomplicated societies unlike the present urban complexes or mechanized rural areas.⁴⁸

With the great migration to the urban areas came problems, both for the individuals left behind and for those in a new setting. Those too old or poor to move faced the demoralization of the growing inadequacy of old ways and a weakened family, school, and community manpower structure. In the cities the migrants found inferior living conditions and few jobs for the unskilled worker. Middle-class citizens moved to the suburbs, leaving entire sections of a city inhabited by the economically disadvantaged. Poor leadership, no tax base, unstable life style, little civic pride, and little governmental aid soon made the disadvantaged's urban environment a place for despair.⁴⁹ The number of economically disadvantaged city dwellers is difficult to estimate. Gottlieb and Ramsey⁵⁰ stated that geographically about 50 percent of the poor lived in cities, and most of these are Negroes. Cities such as New York, Chicago, Philadelphia, Washington, Detroit, Cleveland, and Baltimore have as many as 30 percent of their children in the disadvantaged classification.⁵¹ The actual number of disadvantaged children, based upon a family income of \$3,000 a year for a family of four, was 16.7 million in 1959 and 12.5 million in 1966. Even in 1966, after a continued run of prosperity and steadily rising family income, one-fourth of the nation's children were in families living in poverty or hovering just above the poverty line.⁵²

It is the purpose of this investigation to study the educational participation rates of the economically disadvantaged students in the area vocational technical schools in Kansas.

THE MENTALLY HANDICAPPED

Regarding historical educational provisions for the retarded, Carroll states:

Historically, administrators in the area of special education have assumed that a child who was mentally retarded should be placed in a segregated setting where he would have a chance for success with intellectually comparable peers.

. . . when an EMR child is placed in a segregated educational setting, the following questions must be raised: What impact is there on the youngster's self perception when he is singled out from a classroom of friends and neighbors, and placed in a different room, if not in a different school? Does this action confirm or stimulate any existing feeling of unworthiness?⁵³

Stevens views the role of residential facilities for the mentally retarded as a responsibility shared by the family, community, and state.⁵⁴

Many institutional residents are of school age. They often are institutionalized for a substantial length of time. Because of learning deficiencies of the mentally retarded, education constitutes a very important program component. The school within the residential setting must provide the types of learning opportunities which the mentally retarded can use.⁵⁵

Tarjan states the following concerning educational programs within schools for the mentally retarded:

There must be classes for children of various ages and mentality levels, for those with relatively good health and for those with superimposed physical, sensory or psychological handicaps. There must also be educational opportunities for the adults because motivation for learning is often delayed. Goals of the school program should not be limited to scholastic achievements. The acquisition of social competence and of vocational skills is at least as important as the knowledge of academic content.⁵⁶

Although Fraenkel reports that no more than five percent of the total number of mental retardates are placed in institutions for the retarded,⁵⁷ the 1967 President's Committee on Mental Retardation reported more than 200,000 institutionalized retardates in the United States.⁵⁸

In comparing rates of institutionalization for the years 1936-1938 and 1953-1955, Sabagh and Windle found an increase in rates for children and a decrease for adolescents and adults.⁵⁹ In 1950, approximately 46,000 mentally retarded persons in institutions were under 21 years of age; this was about 37 percent of the total number of institutionalized retardates.⁶⁰ By 1960, there was a general trend to earlier admission of the more severely retarded.⁶¹

There has been an increasing trend in the number of mentally retarded in institutions who are provided with educational, recreational, or vocational training programs.⁶² In 1963, a total of 38,638 mentally retarded children, less than 20 years of age, were educated in residential schools. Hunter reports that, during the 15 years preceding 1964, there was a 60 percent increase in the number of institutionalized mental retardates.⁶³

Levine reports that institutions for the mentally retarded have been criticized for not fulfilling the educational needs of patients.⁶⁴ Curriculum requirements for the mentally retarded in residential and day schools are much the same, except residential schools are expected to supply more educational and environmental advantages to compensate the child for having been separated from home and family.⁶⁵

The residential school classrooms provide situations in which the mentally retarded children do not share the attention of their teachers with more adequate children such as those in regular classrooms, nor do they meet these children on a competitive basis. In addition, when they leave their classrooms, the institutionalized retardates return to an environment which they share in common with the other children in their classrooms. Within the residential community, retardates attending school classes frequently are among the most rather than the least favorably endowed because of their educability.⁶⁶

Regarding placement in residential school classes, Stanton and Cassidy state the following:

. . . most enrollments in a public residential classroom are an incidental result of court action in response to an acute problem of some kind, ranging all the way from school truancy to juvenile delinquency. But with these children an additional factor must be taken into consideration. Within the total residence community, they are a privileged minority whose status and prestige are

enhanced by virtue of their selection for the school experience. This fact is reflected in their enthusiasm for school as reported by their teachers despite relative deficiency in academic performance.⁶⁷

Teachers of institutionalized retarded children portrayed these children as often functioning below their ability to learn. The teachers noted that residential school children were both more keenly interested in school and more afraid to fail than were regular class children. Placement in the classroom appears to be highly desirable for the school children to whom it is a source of both prestige and diversion; however, lack of competition may reduce the incentive to function at maximum capacity.⁶⁸

As advocated for the education of all retarded students, the selection of teaching techniques to be used with retardates in schools should be based on the individual needs of each child.⁶⁹ Goldberg and Younie list some difficulties of schools in providing individualized educational procedures for the children. Some advocate a society-centered approach, which is designed to prepare an individual to live in a particular kind of society (i.e., the institution). Also, schools are hampered by the fact that disabilities are described in terms which cannot always be generalized to educational objectives; for example, the label "mentally retarded" does not fully describe a child who profits from concrete experiences and examples because he had difficulty in abstract thinking.⁷⁰

To provide a truly developmental educational environment, the answer may be in developing a new curriculum that is closer, physically and philosophically, to the community it serves. This would encompass a change from large isolated facilities to small units close to the homes of their families and to the health, education, and social resources of the community and a replacement of the old concept of custodial care, wherever it still exists, with modern programs of education, therapy, and research.⁷¹

Roos, in discussing increasing cooperation between institutions and communities, states:

Institutions are typically actively seeking avenues for reaching into communities and for serving community needs. As a product of increased public acceptance of the retarded, communities are becoming less concerned with keeping the institution at a 'safe distance' and they are inviting the institution into the community. The basic result of this rapprochement is that the institution is rapidly assuming a key role in the broad continuum of services becoming

available to the retarded. Rather than remaining an agency distinct and separate from community programs, the institution is assuming a prominent part in community programs.⁷²

Characteristics of the mentally handicapped are difficult to summarize since these handicapped are a heterogeneous group. They differ greatly in their academic achievement, behavior, family background, emotional stability, physical and motor characteristics, personality, level of general development, and etiology.⁷³ Because of the variance within the group, there may be a wide difference of individuals who have the same level of intelligence. Intelligence should not be the only criteria used in the assessment of the individual and his potential.

Hunt, in his summary of mentally retarded children, indicated that at the end of schooling the retarded individual may reach an academic level ranging from the second to the seventh grade. He normally will lack motivation, due to failure and appropriate learning stimulation and a low reading level; but his mathematical reasoning will be about what is expected for his mental age.⁷⁴

All of the fifty states now have special provisions in some form of legislation for special education for the mentally handicapped. This study is concerned about participation rates for the mentally handicapped that are normally considered "educable" in the vocational school environment. This term implies that they are individuals who can profit from an academic curriculum and will be able to function independently in a community upon the completion of schooling. These individuals can be included into vocational education and profit from such education. This definition as stated, coincides with the requirements of the mandatory school attendance statutes that force schools to offer suitable educational programs to meet their needs.

THE PHYSICALLY HANDICAPPED

Much literature prior to 1956 advocated separation of crippled children for various reasons. The advocates of this viewpoint believed the child would receive more individual attention to meet his physical, mental, and emotional needs. Besides, he would not be able to keep up with the normal children in a regular classroom. The opinion that he may become an object of derision of the normal children was also expressed. It was hoped

that by being a member of a homogeneous group, the feeling of being different would be alleviated.⁷⁵

Integration is indeed desirable, but only when the particular subjects can be identified that will not affect the disability of the child, and which can be performed with other children. However, some children may need to be served through a central facility, and segregation may offer the best method of rehabilitation.⁷⁶

The handicapped child has been the victim of priorities enjoyed by other children. This lag in the provision for the physically handicapped is a nationwide lag.⁷⁷

The consensus of the various authors reviewed was that the education of physically handicapped children can be provided, for the most part, within integrated school rooms among typical students. The attitude held by most educators of exceptional children seems well delineated in a statement of the American Foundation for the Blind. The organization, in the Pine Brook Report, endorsed this statement:⁷⁸

The education of the blind with the sighted children in public and private school is predicated upon the basic philosophy that all children have a right to remain with their families and in their communities during the course of their education; that a blind child has the right to be counted as one of the children of a family and of the community; and that both the family and the community have an obligation to provide for the blind child, as a minimum, the equivalent of what he might have had if sighted.

Most of the educational programs have been geared toward the advancement of the physically healthy child of normal or slightly superior intelligence.

Fouracre described the physically handicapped as those "who suffer from a physical defect, either congenital or acquired to an extent that their educational, social, or vocational pursuits are in some way impeded."⁷⁹ He also clarified the definition by including the deaf, hard of hearing, blind, partially sighted, crippled, cerebral-palsied, and those with special health problems such as cardiac, epileptic, allergic, and diabetic.⁸⁰ This list omits brain injuries, also a form of a physical handicap.⁸¹

The physically handicapped make up a large part of the individuals that are not trained. It has been estimated that about sixty percent of the non-working head-of-the-household males that live in the poverty classification are chronically ill or suffer from some physical disability.⁸²

Although Neff saw some similarities between the minority groups and the disabled, he wrote:

... expert opinion is fairly unanimous that racial and religious grouping do not actually differ in basic human capacities and potentialities. On the other hand, it cannot be denied that there are disabling conditions which result in genuine impairments of functional capacity. While the extent and significance of such functional losses are readily exaggerated, some disabled persons may⁸³ not be able to function as well in certain areas as the nondisabled.

Individuals who are disabled have to deal with prejudice in finding vocational schooling. They are also faced with architectural obstacles that interfere with their successful adaptation to the environment of the schools.

Physically handicapped youth in the secondary school have frequently been denied meaningful vocational-academic exposures. Often separate systems have been established for these students. In some of these separate or segregated programs, vocational educators limit training to activities which may be far below the individual's potential and remove him from the social mainstream of the school.⁸⁴

School districts often build area vocational technical schools for the intellectually capable, social skill centers for the mentally subnormal, scholars programs for the intellectually gifted and programs with great ambiguity and little direction for the majority of students. It is interesting to note that all of the programs function as if they were housed in separate agencies and dealing with different species of human beings.⁸⁵

A major concern should be to avoid locking the physically handicapped into a rigidly prescribed program. Ideally, through the support of regular evaluation and counseling, their needs will dictate specialized services.⁸⁶

The handicapped student may or may not present an instructional problem in training, depending on the extent of his disability, his acceptance of it, and the group's acceptance of him. There are students in nearly every program whose physical handicaps prevent their profiting fully from the training. It is not easy to determine the extent to which physical handicaps influence occupational opportunities in the form of benefits received from occupational training. The physical handicap cycle is a vicious one, with the student as the victim unless special programs can be provided to permit equal training opportunities.⁸⁷

VOCATIONAL EDUCATION

The term "vocational education" is relatively new in educational literature. The term is simply a new name for a practice as old as civilization itself.⁸⁸

In the earliest forms, vocational education could be defined as, "education for work." Struck defined vocational education, as it was first conceived, "to give training that prepares persons definitely for wage earning in trade or industrial pursuits."⁸⁹ This concept of vocational education inferred that it was limited to specific subjects. "This point of view disregards many vocations and fails to recognize the purpose of the learner."⁹⁰

In 1917, the Federal Board for Vocational Education defined vocational education as, "training for the common wage earning employments."⁹¹

The Southern States Work Conference in 1945, defined vocational education as:

In its simplest terms Vocational Education is that aspect of education that aims at the development of human abilities in terms of knowledge, skills and understanding so that the individual may serve happily and efficiently in carrying on the activities in the vocational pursuits of his choice.⁹²

This definition emphasizes that vocational education is in part the development of the individual. This definition also suggests that vocational preparation is limited only by the choice of the individual. Vocational education should do more for the individual than just prepare him for a job. It should develop a good citizen as well as a proficient worker.⁹³

The definition of vocational education given in the vocational education laws of 1963 and 1968, were more inclusive. It gave an even broader meaning by allowing vocational education to prepare individuals for employment as semi-skilled and skilled workers, technicians, sub-professionals in recognized occupations, and in new and emerging occupations. It does not allow for the preparation of individuals for an occupation that requires a baccalaureate degree. Generally the accepted definition is, "education which requires less than a baccalaureate degree for employment."⁹⁴

Evans defines vocational education in a broad sense as: "that part of education which makes an individual more employable in one group of occupations than in another."⁹⁵

In order to give some relationship of vocational education to general education, general education should also be defined. Evans characterizes general education as: "education of equal value regardless of the occupation which is to be followed."⁹⁶

Vocational Education should not be separated from general education since they have the same basic objective: "the education of youth." Conant felt that, "vocational education is not offered in lieu of general academic education, but grows out of it, supplementing and enhancing it."⁹⁷

Evans supported the same idea by stating:

Vocational education and general education are intimately interwoven. In most instructional situations some students are there for vocational purposes. Every general education course can have occupational value, and awareness of occupational goals leads students to see the relevance of certain content which otherwise might appear highly irrelevant.⁹⁸

Gardner cited his reaction about vocational education for the disadvantaged in that:

It is possible to have excellence in education and at the same time to seek to educate everyone to the limit of his ability. A society such as ours has no choice but to seek the development of human potentialities at all levels. It takes more than an educated elite to run a complex, technological society. Every modern, industrialized society is learning that hard lesson.⁹⁹

The student that does not fit into the general pattern of a society can produce a challenge to education. Barlow warned vocational educators that:

The real challenge to vocational education arising from increased attention to the disadvantaged American is the need for the nation in the future to provide occupational instruction to a greater variety of workers and potential workers than ever before and to provide also for a wider variation of individual need because of the complexities of cultural disadvantaged. It is obvious, however, that vocational education is only one of the facets of the solution.¹⁰⁰

Like other forms of education, vocational education has gone through periods of change and new directions have been taken. Vocational education has been forced to give attention to the individual. Education cannot solve all of man's problems, but it must help society to improve the chance for the individual to achieve social gains so as to improve all of society.¹⁰¹

KANSAS AREA VOCATIONAL-TECHNICAL SCHOOLS

The area school system was originated with the promise to provide vocational training for all Kansans desiring a salable skill for entry level employment opportunities or to gain supplementary knowledge and skills which would enable them to perform their present jobs more efficiently.

The 1963 Kansas Legislature authorized the establishment of area vocational-technical schools. This state authorization was further emphasized by the Federal Government through the Vocational Education Amendments of 1968.¹⁰² The 1968 Amendments had as its purpose:

. . . to authorize Federal grants to States to assist them to maintain, extend, and improve existing programs of vocational education, and to provide part-time employment for youths who need the earnings from such employment to continue their vocational training on a full-time basis, so that persons of all ages, in all communities of the State--those in high schools, those who have completed or discontinued their formal education and are preparing to enter the labor market, those who have already entered the labor market but need to upgrade their skills or learn new ones, those with special educational handicaps, and those in post-secondary schools--will have ready access to vocational training or retraining which is of high quality, which is realistic in light of actual and anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training.¹⁰³

These Vocational Education Amendments of 1968 became a part of the Kansas Statutes when approved by the Legislature during its 1969 session.¹⁰⁴

Before school districts, junior colleges or state institutions of higher learning could implement the area school concept, they had to present a plan to the state board.

This plan should be prepared in cooperation with the assistant commissioner of vocational education, on forms developed and provided by the state board. Information included in support of the plan for any area vocational-technical school shall include, but not be limited to, the following criteria:

1. Concentration of population within a reasonable community service area;
2. Total school enrollments in grades one through eight, and in grades nine through twelve, separately;
3. Number of high school graduates within the area to be served;

4. Probability of sustained growth in school enrollments within such areas;
5. Identification of educational services needed within said area;
6. Local interest and attitudes toward the program within said area;
7. Ability of such areas to contribute to the financial support of the program;
8. Consideration of the area in relation to other requests for programs of vocational-technical training to prevent overlapping or duplication of educational services.¹⁰⁵

Upon receipt and examination of such plans and supporting evidence, the state board shall conduct hearings, investigate school records, and such other information relating to vocational-technical training as it may deem appropriate.

After approval of such a plan, the school may be established and shall be officially classified by the state board as an area vocational-technical school.

A brief explanation is in order here. The area vocational system began with seven Kansas area vocational-technical schools which started operation in 1964. These schools were located at Beloit, Coffeyville, Dodge City, Emporia, Goodland, Hutchinson-Newton-McPherson, and Topeka. The next year, two more area vocational-technical schools were established at Salina and Wichita. Two years later three more area schools began operations at Arkansas City, Atchison, and Manhattan. The two most recent additions to the area vocational-technical school system in Kansas were started at Kansas City and Liberal. The total number in 1973 stands at fourteen Kansas area vocational-technical schools which make up the Kansas area vocational system, as illustrated in Figure 14 for all their locations.¹⁰⁶

Today, the Kansas area vocational schools are of two types. The first area school type, known as area vocational-technical schools, has as its governing body a board of control constituted of members from the agreed upon participating Unified School Districts. The funding for these schools comes from the same participating districts. The area schools to which this definition applies are:

1. Central Kansas Area Vocational-Technical School headquartered at Newton;

2. North Central Area Vocational-Technical School at Beloit;
 3. Northwest Kansas Area Vocational-Technical School at Goodland,
- and
4. Southeast Kansas Area Vocational-Technical School at Coffeyville.¹⁰⁷
- The second area school type, known as Kansas area vocational schools, refers to:

. . . any vocational education school approved by the state board of education of a school district, or a board of trustees of a community junior college, or as part of an institution under the state board of regents, or the board of regents of a municipal university.¹⁰⁸

The funding source for these schools is the individual school district, community junior college, or board of regents which governs it. Although the Kansas State Board for Vocational education originally authorized the development of twenty area schools,¹⁰⁹ only fourteen schools have been established to date.

SUMMARY

Kansas has implemented a new automated student accounting system which was designed to collect background data on all vocational students in the state. The system utilizes an optical scan enrollment sheet which provided the data used in this study.

The academically disadvantaged were defined as individuals whose academic achievement are not equal to their academic potential. Causes related to academic disadvantages include perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, motivational deprivation, environmental factors and cultural backgrounds. The one factor students who are academically disadvantaged have in common is that they are underachievers; they often have little else in common.

Minority groups were defined to include persons who identified themselves with racial groups other than Caucasians. The literature indicates that minority groups are victims of discrimination in general and of educational discrimination in particular. The obverse of discrimination in education is equality in education. There seems to be little agreement, however, on what is meant by equality, i.e., does equality mean equal

expenditure per student, racial balance, equal learning climates, equal opportunity to develop fully, or equal development of learning abilities.

The economically disadvantaged were defined as those persons who are in serious need. This definition is relative to the individual's personal judgment of himself. The federal government defines the economically disadvantaged in terms of a minimal level of family income. Possibly the most serious ramification of being economically disadvantaged is the effect on self-image. The work ethic teaches that a man's worth is determined by how much money he has, the car he drives, his address, his clothes, and his ability to spend. The poor must, therefore, in the eyes of society, be substandard individuals. The general attitude of the economically disadvantaged is one of despair which can significantly effect their performance in school.

The mentally handicapped have been defined as those persons with an IQ of less than eighty. In the recent past these persons have been considered as not having the ability to contribute significantly to society. As a result, many have been institutionalized. Present thoughts, however, are that individuals who fall in the trainable or educatable categories could and should be prepared to function in the general society to the limits of their abilities.

The physically handicapped, like the mentally handicapped, have often been isolated from the rest of society. Physical handicaps are defined as including the deaf, hard of hearing, blind, partially sighted, crippled, cerebral-palsied, and those with special health problems such as cardiac, epileptic, allergic and diabetic. As in the case of the mentally handicapped, the physically handicapped are now being encouraged to enter the general society and participate to the extent of their abilities.

A society such as found in the United States has no choice but to seek the development of human potentialities at all levels. It takes more than an educated elite to run a complex technological society. Every modern industrialized nation is learning this first hand. Vocational education is a means of training workers for the subprofessional jobs which are essential for society to function. Vocational education is more rigorously defined as the edication of persons for employment at less than the professional level.

Kansas has recognized the need of vocational education by establishing

fourteen area vocational technical schools across the state. The area school system was originated with the purpose of providing training for all students desiring a salable skill for entry level employment or desiring to gain supplementary knowledge or skills which would enable them to perform their present jobs more effectively.

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Chapter 28

RESEARCH METHODOLOGY

INTRODUCTION

The purpose of this chapter is to describe the procedures and tools used to evaluate the hypotheses presented in Chapter 26 (see pages 301, 302 and 303). Since this study utilizes data collected by the Kansas Manpower Utilization System for Training (K-MUST) and the Division of Vocational Education of the Kansas State Department of Education, the instruments and data collection procedures described here will represent methods used by these organizations to gather information.

THE POPULATIONS

There are two populations directly involved in this study. These are the following:

1. The population of vocational and technical students in full-time programs in the Kansas Area Vocational and Technical Schools (including satellite programs) in the 1972-73 school year. The population consists of 18,480 students (adult, post-high school and secondary).

2. The population of persons in the communities served by the Area Vocational and Technical schools. This population consists of 1,626,224 persons. (Note: The counties included in the communities served are listed in Appendix K).

THE SAMPLES

In this study, the samples will consist of the total population of individuals being served by the fourteen area schools and by the general population served by the area schools. This is possible through the use of

demographic data from the 1970 census and the data provided by the K-MUST project in conjunction with the State Department of Education.

THE INSTRUMENT

The instrument used to gather student enrollment data (including information on handicapped and disadvantaged students) was the optical scan form VE-50 designed by the Department of Education for their student accounting system. This form is completed by each student enrolled in vocational and technical education. On the form, the student indicates the program and school in which he is enrolled. The teacher indicates on the form whether or not the student is economically and/or academically disadvantaged and mentally or physically handicapped. Minority groups are identified when the student marks his race. (For an example of this form, see Figure 11.)

DATA COLLECTION

The VE-50 optical scan forms were distributed to Area School directors in early September of 1972. The directors distributed the forms to the teachers within two days after receiving them.

The teachers guided students in the completion of the forms between September 15, 1972 and September 30, 1972. Once the student had completed his part of the form, the teacher marked disadvantaged and handicapped data on the form as was relevant to each student.

The forms were returned to the State Department of Education in the first week of October 1972 where they were visually checked for completeness. The forms were then forwarded to the K-MUST project for processing.

The K-MUST project staff used the Opscan 100 DM to transfer the data from the VE-50 optical scan form to computer tape. The data on the tape was then sorted and program rosters were printed.

The rosters were mailed to the teachers for verification. Any changes in the data that were necessary were completed in late January in 1973. This verified tape was then made available for this study.

STATISTICAL TOOL

One statistical tool was used to analyze the data for this study. The tool used is a technique normally described in most standard statistical textbooks. Hypotheses 1 through 15 require the use of the Chi Square Test of Independence.

The Chi Square Test of Independence is an extremely useful statistical procedure for determining whether two nominal (or higher level) measures are related. If one of the variables is group membership, and the other a criterion of some sort, the test may be used to determine whether two or more populations are distributed in the same fashion with respect to the criterion.¹

In this study, group membership will be broken into the following categories:

1. Hypotheses 1, 6 and 11; academically disadvantaged persons versus non-academically disadvantaged persons,
2. Hypotheses 2, 7 and 12; minority group members versus non-minority group members,
3. Hypotheses 3, 8 and 13; economically disadvantaged persons versus non-economically disadvantaged persons,
4. Hypotheses 4, 9 and 14; mentally handicapped persons versus non-mentally handicapped persons, and
5. Hypotheses 5, 10 and 15; physically handicapped persons versus non-physically handicapped persons.

The criterion on which these hypotheses will be tested are:

1. Hypotheses 1, 2, 3, 4 and 5; vocational students versus the general population,
2. Hypotheses 6, 7, 8, 9 and 10; students in different program types, and
3. Hypotheses 11, 12, 13, 14 and 15; students in different programs of the same type.

A Chi Square value is calculated where the size of the value is determined by the discrepancies in the match of the two data groups with respect to the criterion; the value being higher where the discrepancy is greater. If the Chi Square value is greater than some pre-determined figure,

then a significant difference is said to exist. The confidence in which this statement can be made rests on the pre-determined figure selected. In this study, ninety-five percent confidence will be acceptable and hence, the figure will be selected on this basis.

The first step in determining the Chi Square value is to arrange the data into rows and columns with the columns being the groups and the rows being the criteria. Once the data has been arranged in this fashion, the values in the columns and rows are summed. When the columns and rows have been summed, the expected frequency for each cell is computed. Expected frequencies are the values which would exist in the cells if the row and column sums did not change and if the distributions were identical. The expected frequency for each cell is derived by multiplying the row total times the column total and dividing by the total of all entries.

The Chi Square contribution of each cell is computed by squaring the difference of the cell's expected frequency and actual value and dividing by the expected frequency. The Chi Square value is the sum of all Chi Square contributions.

The pre-determined value for the ninety-five percent confidence level is computed with the following formula for all df's greater than 30; when $df \leq 30$, a table lookup was used.

$$\chi^2 = 1/2 (1.639 + \sqrt{2df-1})^2$$

In this formula, df stands for degrees of freedom while χ^2 stands for the pre-determined or tabular Chi Square value. The degrees of freedom are determined by multiplying the number of rows minus one, times the number of columns minus one. The reason one is subtracted is that if a set of items is assigned to a set number of cells where row and column totals are fixed, one row and one column of cells are not free to vary.²

Again, if the Chi Square value computed using the two distributions is greater than the tabular Chi Square value, then a significant difference is said to exist between the two distributions.

ANALYSIS PROCEDURES

The analysis procedures used to affirm or reject the hypotheses examined in this study are explained below.

Hypotheses 1 through 15 will be tested using the Chi Square Test of Independence where group membership is being or not being in a (1) specific handicapped or disadvantaged group and the criteria sets are general population versus enrollment in vocational education programs, (2) program types, or (3) programs within program types.

Hypotheses 1, 2, 3, 4 and 5 will utilize the general population versus vocational enrollment criteria. An example of cell entries for analyzing these hypotheses might be as follows (see Figure 14).

	General Population	Vocational Enrollment
Physically Handicapped	1,000	300
Not Physically Handicapped	50,000	10,000

Figure 14. Population versus Vocational Enrollment

Hypotheses 6, 7, 8, 9 and 10 will utilize the program type criterion. An example of cell entries for analyzing these hypotheses might be as follows (see Figure 15).

	Welding	Auto Mech	Nursing	Child Care	Drafting	Clerical	Advertising	Electronics
Physically Handicapped	7	10	8	15	9	5	1	3
Not Physically Handicapped	150	146	92	65	127	220	30	78

Figure 15 Program Type

Hypotheses 11, 12, 13, 14 and 15 will utilize the program within a program type criterion for each program type with two or more schools

having that program. The hypotheses will be considered to be affirmed only if a significant number of the Chi Square Tests (one test for each program type) are affirmed. An example of cell entries for analyzing these hypotheses might be as follows (see Figure 16).

		Welding Programs								
		Program 1	Program 2	Program 3	Program 4	Program 5	Program 6	Program 7	Program X	Program 14
Physically Handicapped		15	17	13	19	16	14	12	22	10
Not Physically Handicapped		535	627	384	703	430	521	608	345	492

Figure 16. Program within a Program Type

COMPUTER PROGRAMMING ANALYSIS

A computer program was written by the investigator to process the 525 Chi Square test which was used to determine the disposition of the 15 hypotheses examined in this study. The computer language used for this program was COBOL and a program listing is presented in Appendix L.

A brief functional description of the working logic is achieved through describing sections of the PROCEDURE DIVISION. The MAIN-LINE SECTION is the control feature and is supported by four other sections that are retrieved and activated by the MAIN-LINE SECTION'S logic.

The first of the four supporting sections is the INITIALIZING-SECTION. This section moves zeroes, blanks, etc. into appropriate variable areas. The second supporting section is the READ-DATA SECTION. This section reads input data for calculations and prepares a matrix of the data by school, program and the types of students. The RAW-DATA-PRINT SECTION is the third supporting section which prints raw data by school by program and the types of students as illustrated in Appendix M. The last supporting section is the COMPUTE-CHI SECTION. This section computes tabular and

and calculated chi square values, then prints output data for all hypotheses in this study.

The first three paragraphs within the MAIN-LINE SECTION perform standard housekeeping functions such as open files and retrieval of READ-DATA and INITIALIZING SECTIONS. The fourth paragraph calls the section which dumps raw data for checking purposes. The next five paragraphs compute 70 chi's to determine the disposition of hypotheses 1 through 5. The next five paragraphs compute five chi's with a matrix size of 2 X 90 to determine the disposition of hypotheses 6 through 10. Finally the disposition of hypotheses 11 through 15 are determined when 450 chi's are computed in the last five paragraphs. The WRAP-UP paragraph closes all files and stops execution of the program.

SUMMARY

Two populations are involved in this study; the population of students in Kansas's fourteen Area Vocational Technical Schools and the population of citizens served by these Area Schools. The samples used to represent these populations consist of the entire populations. This is possible through the use of U.S. Census data and the Kansas Student Accounting System.

Data collection procedures were designed by the K-MUST staff in the summer and fall of 1972. (Note: the investigator served as a systems analyst on this project and was directly involved in the development and implementation of the Student Accounting System.) The basic instrument is an optical scan form designated the VE-50 by the State Department of Education. Each vocational student in the area schools completed one of these forms under the supervision of a teacher and the data were used to generate a student data base. The State Department of Education has made this data base available for this study.

The statistical tool used in this study is the Chi Square Test for Independence. The group membership is related to being or not being in a specific handicapped or disadvantaged group while criterion sets are general population versus students in the area schools, enrollment in particular programs and enrollment in programs within program types.

A computer program was developed to analyze the 525 Chi Square Tests used to evaluate the hypotheses examined in this study. This program is found in Appendix L.

FOOTNOTES

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Chapter 29

ANALYSIS OF DATA

INTRODUCTION

This chapter presents (1) a summary of the raw data used in this study, (2) an analysis of the seventy Chi Square tests used to evaluate Hypotheses 1 through 5, (3) an analysis of the four hundred and fifty Chi Square tests used to evaluate Hypotheses 11 through 15, (4) the disposition of all fifteen hypotheses and (5) a brief summary of the findings.

SUMMARY OF RAW DATA

There were 18,480 students in Kansas' fourteen area schools as reported by the K-MUST Student Accounting System. This figure is above 90 percent of all area school enrollment for the 1972-73 school year. Of this number, 1093 or six percent were reported as academically disadvantaged, 1662 or nine percent were reported to be in minority groups, 1417 or eight percent were reported to be economically disadvantaged, 642 or three percent were reported to be mentally handicapped, and 460 or two percent were reported to be physically handicapped. The total number of handicapped and/or disadvantaged students was reported to be 3808 or twenty-one percent. The total is not equal to the sum of the categories as some students had two or more disadvantages or handicaps. Appendix M provides a summary of disadvantaged and handicapped data by school and by program.

CHI SQUARE TESTS FOR HYPOTHESES 1 THROUGH 5

Seventy Chi Square tests were used to evaluate Hypotheses 1 through 5. One test was run for each school (14) versus each handicap or disadvantage group (5). In 50 of the tests, a significant difference was detected. Of the 50 significant tests, 31 indicated that the proportion of students in

the disadvantaged or handicapped group in the school was greater than the proportion of persons in the disadvantaged or handicapped group in the general population served, while 19 of the significant tests indicated the opposite situation existed. When the percent of disadvantaged or handicapped enrolled in an area school is equal to or greater than the percent of disadvantaged or handicapped in the general population, then that area school is said to serve a proportionate share of the disadvantaged and handicapped. Of the fourteen area schools, one serves more than a proportionate share of all disadvantaged and handicapped groups; three served at least a proportionate share of all disadvantaged and handicapped groups; two served at least a proportionate share of four of the five disadvantaged or handicapped groups; three served at least a proportionate share of three of the five disadvantaged or handicapped groups; two served at least a proportionate share of two of the five disadvantaged or handicapped groups; and one served a proportionate share of only one of the five disadvantaged or handicapped groups. It also appears that the academically disadvantaged were being served proportionally by at least eleven of the area schools. All schools were proportionally serving minority groups. Nine of the schools were serving the economically disadvantaged proportionally as was the case for serving the mentally handicapped. The physically handicapped were being served proportionally by eight of the schools. Table 30 summarizes the Chi Square tests used to evaluate Hypotheses 1 through 5.

CHI SQUARE TESTS FOR HYPOTHESES 11 THROUGH 15

Four hundred and fifty Chi Square tests were attempted for the evaluation of Hypotheses 11 through 15. One test was attempted for each program type by area school (90) versus each handicap or disadvantage group (5). Of these 450 tests, only 224 were computable since many programs were one of a type or all programs of a certain type had no students who fit a criterion and hence were not testable.

Of the 224 computable tests, 123 were retained. This number was significantly greater than the number that would have been expected to be retained by chance; hence it was assumed that the significant differences were not produced by chance. Table 31 presents the results of the Chi Square tests used to evaluate Hypotheses 11 through 15.

Table 30
Computed CHI VALUES for Hypotheses One
Through Five Chi Square Tests

School	HYP-1	HYP-2	HYP-3	HYP-4	HYP-5
Central Kansas AVTS	41.69H	65.10H	7.45H	.21R	.33R
Cowley County AVTS	10.55L	.66R	.18R	7.80H	1.91R
Flint Hills AVTS	1277.59H	66.59H	33.31H	71.23H	18.71H
Kansas City AVTS	49.91L	280.40H	8.81L	49.83L	42.93L
KAW AVTS	.41R	12.81H	6.09L	21.86L	34.58L
Liberal AVTS	113.98H	84.22H	1.00R	16.31L	10.81L
Manhattan AVTS	741.42H	.38R	37.49L	22.96L	12.04L
N Central Kansas AVTS	106.81H	3.81R	40.77H	.23R	.81R
NE Kansas AVTS	.75R	.14R	5.15L	7.10L	5.53H
NW Kansas AVTS	198.03H	1.44R	.14R	120.21H	127.77H
Salina AVTS	1.61R	46.80H	9.71L	2.80R	.11R
SE Kansas AVTS	273.74H	15.54H	13.00H	15.41H	1.54R
SW Kansas AVTS	41.94H	149.00H	31.78H	10.95H	17.07L
Wichita AVTS	12.14L	843.87H	24.94H	.00R	29.85L

Tabular Chi = 3.84 (for the .05 Level)

R = Rejected

H = Proportion in schools higher than proportion in population

L = Proportion in schools lower than proportion in population

Table 31

Computed CHI VALUES for Hypotheses Eleven
Through Fifteen Chi Square Tests

Program Name	HYP-11	HYP-12	HYP-13	HYP-14	HYP-15
Agri Related	U/C	7.81/ 5.73R	7.81/ 11.62	U/C	U/C
Voc Agri	11.07/ 87.10	11.07/ 29.92	11.07/ 8.10R	11.07/ 20.20	11.07/ 29.83
Agri Mech	5.99/ 3.06R	5.99/ .36R	5.99/ 6.50	5.99/ 1.28R	5.99/ 3.41R
Horticultural	5.99/ 30.37	5.99/ 2.39R	5.99/ 3.80R	5.99/ 23.40	5.99/ .67R
Farm Management	9.49/ 17.56	9.49/ 3.18R	9.49/ 16.18	9.49/ 41.25	9.49/ 23.09
Agri Bus Tech	5.99/ 10.63	U/C	5.99/ 16.30	5.99/ 7.57	5.99/ 2.59R
Agri Mech Sec	3.84/ .83R	U/C	3.84/ 2.68R	3.84/ 6.63	3.84/ 2.19R
Horticultural Sec	U/C	U/C	U/C	U/C	U/C
Distri Ed Sec	16.92/ 194.25	16.92/ 25.71	16.92/ 38.93	16.92/ 90.60	16.92/ 69.44
Distri Ed Post	12.59/ 63.32	12.59/ 5.40R	12.59/ 32.24	12.59/ 8.39R	12.59/ 2.93R
Distri Ed Adult	U/C	7.81/ 14.61	7.81/ 3.99R	U/C	U/C
Med Off Assist	U/C	U/C	U/C	U/C	U/C
Nurses Aide	12.59/ 10.44R	12.59/ 17.40	12.59/ 26.98	12.59/ 13.49	12.59/ 7.01
Dental Hygienist	U/C	U/C	U/C	U/C	U/C
Medical Lab Tech	U/C	U/C	U/C	U/C	U/C

Table 31

Program Name	HYP-11	HYP-12	HYP-13	HYP-14	HYP-15
Pract Nursing	15.51/ 126.95	15.51/ 45.60	15.51/ 38.91	15.51/ 21.78	15.51/ 55.77
Med Rec Sec	7.81/ 2.37R	7.81/ 9.96	7.81/ 8.87	7.81/ 4.90R	7.81/ 1.06R
Ward Clerk	U/C	5.99/ 7.26	5.99/ 4.43R	U/C	5.99/ .99R
Comp Home Ec	5.99/ 17.62	5.99/ 1.45R	5.99/ 40.63	5.99/ 3.81R	5.99/ 1.50R
Child Development	U/C	U/C	U/C	U/C	U/C
Clothing	11.07/ 5.14R	11.07/ 108.80	11.07/ 29.62	11.07/ 3.26R	11.07/ 1.50R
Consumer Ed	U/C	U/C	U/C	U/C	U/C
Boy's Home Ec	U/C	U/C	U/C	U/C	U/C
Family Living	U/C	U/C	3.84/ 2.35R	3.84/ .42R	3.84/ .42R
Foods and Nutrition	U/C	U/C	U/C	U/C	U/C
Housing and Home Furn	U/C	5.99/ 4.25R	U/C	U/C	U/C
Child Care Service	U/C	U/C	U/C	U/C	U/C
Intro to Sewing Mach	5.99/ 56.79	5.99/ 13.77	5.99/ 11.32	5.99/ 33.12	5.99/ 4.00
Food Production	11.07/ 35.12	11.07/ 27.91	11.07/ 50.75	11.07/ 51.28	11.07/ 8.00
Home Furn. Equip and Sr	3.84/ 2.30R	3.84/ 8.27	3.84/ 2.30R	U/C	3.84/ 1.00
Home Health Aide	U/C	U/C	U/C	U/C	U/C

Table 31

Program Name	HYP-11	HYP-12	HYP-13	HYP-14	HYP-15
Introduction to Occup	3.84/ .00R	3.84/ 10.29	3.84/ 2.78R	3.84/ 13.35	3.84/ .68R
Business Education	18.31/ 175.29	18.31/ 35.04	18.31/ 72.76	18.31/ 15.63	18.31/ 30.98
Business Ed Coop	19.68/ 170.46	19.68/ 48.60	19.68/ 106.75	19.68/ 22.03	19.68/ 28.60
Business Ed Adult	15.51/ 52.11	15.51/ 16.43	15.51/ 98.21	15.51/ 10.38R	15.51/ 11.13R
Engineering Related	3.84/ .00R	3.84/ .00R	3.84/ .00R	3.84/ .00R	3.84/ 10.22
Chemical Technology	U/C	U/C	U/C	U/C	U/C
Electrical Technology	5.99/ 4.75R	5.99/ .01R	5.99/ .13R	5.99/ .73R	5.99/ .13R
Civil Technology	U/C	U/C	U/C	U/C	U/C
Electronic Technology	9.49/ 10.94	9.49/ 9.40R	9.49/ 4.16R	9.49/ 6.76R	9.49/ .61R
Industrial Technology	U/C	U/C	U/C	U/C	U/C
Instrumentation Tech	U/C	U/C	U/C	U/C	U/C
Mechanical Technology	U/C	U/C	U/C	U/C	U/C
Scientific Technology	U/C	U/C	U/C	U/C	U/C
Police Science	U/C	U/C	U/C	U/C	U/C
Engineering Technology	U/C	U/C	U/C	U/C	U/C
Air Cond and Refrig	9.49/ 24.49	9.49/ 2.92R	9.49/ 2.71R	9.49/ 19.58	9.49/ 8.34R

Table 31

Program Name	HYP-11	HYP-12	HYP-13	HYP-14	HYP-15
Appliance Repair	U/C	U/C	U/C	U/C	U/C
Auto Body Repair	11.07/ 54.60	11.07/ 16.80	11.07/ 10.27	11.07/ 32.55	11.07/ 30.65
Auto Mechanic	22.36/ 357.99	22.36/ 115.20	22.36/ 78.20	22.36/ 94.07	22.36/ 32.63
Auto Speciali- zation	U/C	U/C	U/C	U/C	U/C
Aircraft Mechanic	U/C	U/C	U/C	U/C	U/C
Blueprint Reading	U/C	3.84/ 1.76R	U/C	U/C	U/C
Commercial Art	U/C	U/C	U/C	U/C	U/C
Commercial Photo	U/C	U/C	U/C	U/C	U/C
Carpentry	14.07/ 71.66	14.07/ 118.92	14.07/ 15.05	14.07/ 26.10	14.07/ 10.15R
Electricity	5.99/ 14.94	5.99/ 5.18R	5.99/ 11.85	5.99/ 27.83	5.99/ 33.21
Heavy Equipment	3.84/ 1.79R	3.84/ 2.07R	3.84/ 7.20	3.84/ .85R	3.84/ 1.31R
Masonry	3.84/ 17.23	U/C	3.84/ .51R	3.84/ .35R	3.84/ .78R
Painting and Decor	U/C	U/C	U/C	U/C	U/C
Plumbing	U/C	5.99/ 1.65R	U/C	U/C	U/C
Other Const and Maintenance	U/C	U/C	U/C	U/C	U/C
Custodial Services	U/C	U/C	U/C	U/C	U/C

Table 31

Program Name	HYP-11	HYP-12	HYP-13	HYP-14	HYP-15
Diesel Mechanics	7.81/ 24.70	7.81/ 2.21R	7.81/ 14.16	7.81/ 21.02	7.81/ .68R
Fluid Power	U/C	3.84/ .00R	3.84/ .00R	U/C	U/C
Drafting Occupations	14.07/ 36.55	14.07/ 12.35R	14.07/ 26.45	14.07/ 11.40R	14.07/ 20.10
Ind Electrician	U/C	U/C	U/C	U/C	U/C
Other Elect Occup	3.84/ 1.63R	3.84/ .27R	3.84/ 11.14	3.84/ 5.22	U/C
Electronic Comm	5.99/ 9.08	5.99/ 3.42R	5.99/ 5.26R	5.99/ 2.93R	5.99/ 13.40
Electronic Ind	U/C	U/C	U/C	U/C	U/C
Radio and Television	9.49/ 3.01R	9.49/ 9.77	9.49/ 29.87	9.49/ 59.24	9.49/ 12.92
Other Electr Occup	U/C	U/C	U/C	U/C	U/C
Printing	15.51/ 78.42	15.51/ 14.97R	15.51/ 46.73	15.51/ 86.05	15.51/ 33.38
Machine Shop	12.59/ 18.04	12.59/ 39.31	12.59/ 31.05	12.59/ 27.75	12.59/ 14.92
Machine Tool Operator	5.99/ 2.01R	5.99/ 5.76R	5.99/ 3.49R	5.99/ 7.96	5.99/ 2.52R
Sheet Metal	U/C	5.99/ .19R	5.99/ 16.34	U/C	U/C
Welding	19.68/ 128.13	19.68/ 61.48	19.68/ 60.74	19.68/ 141.62	19.68/ 13.74R
Other Metal Occup	U/C	U/C	U/C	U/C	U/C
Metallurgy Occupations	U/C	U/C	U/C	U/C	U/C

Table 31

Program Name	HYP-11	HYP-12	HYP-13 *	HYP-14	HYP-15
Cosmetology	U/C	7.81/ 23.93	7.81/ 3.81R	U/C	7.81/ 9.23
Plastics Occupations	U/C	U/C	U/C	U/C	U/C
Law Enforcement	U/C	U/C	U/C	U/C	U/C
Other Public Services	U/C	U/C	U/C	U/C	U/C
Refrigeration	U/C	U/C	U/C	U/C	U/C
Small Engine Repair	3.84/ 11.88	3.84/ 2.58R	3.84/ .03R	3.84/ 2.74R	3.84/ 1.78R
Upholstery	U/C	U/C	U/C	U/C	U/C
Millwork and Cab	3.84/ 4.81	3.84/ 2.58R	3.84/ .19R	U/C	3.84/ .19R
Other T and I Occup	3.84/ 2.32R	3.84/ 11.00	3.84/ 13.63	3.84/ 9.42	3.84/ 9.04
Industrial Mechanics	U/C	U/C	U/C	U/C	U/C
Marine Mechanics	U/C	U/C	U/C	U/C	U/C

Tabular Chi/Calculated

U/C = Uncomputable

R = Rejected

DISPOSITION OF HYPOTHESIS 1

Hypothesis 1 which states: "There is a significant difference between the proportion of vocational students who are academically disadvantaged and the proportion of population to be served who are academically disadvantaged," was retained since eleven of the fourteen Chi Square Tests (one for each area school) indicated that there was a difference between the student population and the general population relative to academically disadvantaged persons and this number of retained Chi Square tests could not be expected by chance. Of the fourteen Chi Square tests, three were rejected, eight indicated more than a proportionate share of academically disadvantaged were being served and three indicated that less than a proportionate share of academically disadvantaged were being served.

DISPOSITION OF HYPOTHESIS 2

Hypothesis 2 which states: "There is a significant difference between the proportion of vocational students who are from a minority group and the proportion of the population to be served who are from a minority group," was retained since none of the fourteen Chi Square tests (one for each area school) indicated that there was a significant difference between the student population and the general population relative to minority group persons. Five of the tests were rejected while nine indicated that more than a proportionate share of minority group persons were being served.

DISPOSITION OF HYPOTHESIS 3

Hypothesis 3 which states: "There is a significant difference between the proportion of vocational students who are economically disadvantaged and the proportion of the population to be served who are economically disadvantaged," was retained since eleven of the fourteen Chi Square tests (one for each area school) indicated that there was a significant difference between the student population and the general population relative to economically disadvantaged persons. Of the eleven retained tests, six indicated that more than a proportionate share of the economically

disadvantaged were being served while five indicated less than a proportionate share of the economically disadvantaged were being served.

DISPOSITION OF HYPOTHESIS 4

Hypothesis 4 which states: "There is a significant difference between the proportion of vocational students who are mentally handicapped and the proportion of the population to be served who are mentally handicapped," was retained since ten of the fourteen Chi Square tests (one for each area school) indicated that there was a significant difference between the student population and the general population relative to the mentally handicapped. Of the ten retained tests five indicated that more than a proportionate share of mentally handicapped persons were being served while the other five indicated that less than a proportionate share of mentally handicapped persons were being served.

DISPOSITION OF HYPOTHESIS 5

Hypothesis 5 which states: "There is a significant difference between the proportion of vocational students who are physically handicapped and the proportion of the population to be served who are physically handicapped," was retained since nine of the fourteen Chi Square Tests (one for each area school) indicated that there was a significant difference between the student population and the general population relative to the physically handicapped. Of the nine retained tests three indicated that more than a proportionate share of physically handicapped persons were being served while the other six indicated that less than a proportionate share of physically handicapped persons were being served.

DISPOSITION OF HYPOTHESIS 6

Hypothesis 6 which states: "There is a significant difference between vocational program types relative to the proportion of academically disadvantaged students enrolled," was retained on the basis of a tabular Chi Square value of 111.65 and a computed Chi Square value of 1025.08 which was significant at the .05 level.

DISPOSITION OF HYPOTHESIS 7

Hypothesis 7 which states: "There is a significant difference between vocational program types relative to the proportion of minority students enrolled," was retained on the basis of a tabular Chi Square value of 111.65 and a computed Chi Square value of 1035.93 which was significant at the .05 level.

DISPOSITION OF HYPOTHESIS 8

Hypothesis 8 which states: "There is a significant difference between vocational program types to the proportion of economically disadvantaged students enrolled," was retained on the basis of a tabular Chi Square value of 111.65 and computed Chi Square value of 884.56 which was significant at the .05 level.

DISPOSITION OF HYPOTHESIS 9

Hypothesis 9 which states: "There is a significant difference between vocational program types relative to the proportion of mentally handicapped students enrolled," was retained on the basis of a tabular Chi Square value of 111.65 and a computed Chi Square value of 993.10 which was significant at the .05 level.

DISPOSITION OF HYPOTHESIS 10

Hypothesis 10 which states: "There is a significant difference between vocational program types relative to the proportion of physically handicapped students enrolled," was retained on the basis of a tabular Chi Square value of 11.65 and a computed Chi Square value of 529.88 which was significant at the .05 level.

DISPOSITION OF HYPOTHESIS 11

Hypothesis 11 which states: "For a particular type of vocational

training, there is a significant difference between the proportion of academically disadvantaged students enrolled in different schools," was retained since 28 of the 42 computable Chi Square tests were retained.

DISPOSITION OF HYPOTHESIS 12

Hypothesis 12 which states: "For a particular type of vocational training, there is a significant difference between the proportion of minority students enrolled in different schools," was retained since 23 of the 48 computable Chi Square tests were retained.

DISPOSITION OF HYPOTHESIS 13

Hypothesis 13 which states: "For a particular type of vocational training, there is a significant difference between the proportion of economically disadvantaged students enrolled in different schools," was retained since 29 of the 49 computable tests were retained.

DISPOSITION OF HYPOTHESIS 14

Hypothesis 14 which states: "For a particular type of vocational education, there is a significant difference between the proportion of mentally handicapped students enrolled in different schools," was retained since 26 of the 41 computable Chi Square tests were retained.

DISPOSITION OF HYPOTHESIS 15

Hypothesis 15 which states: "For a particular type of vocational education, there is a significant difference between the proportion of physically handicapped students enrolled in different schools," was retained since 17 of the 44 computable Chi Square tests were retained.

SUMMARY

All of the fifteen hypotheses were retained. First, there were significant differences between the proportion of disadvantaged and handicapped students in the area schools and the proportion of disadvantaged and handicapped persons in the areas being served by the area schools. When the percent of disadvantaged or handicapped enrolled in an area school is equal to or greater than the percent of disadvantaged or handicapped in the general population, then that area school is said to serve a proportionate share of the disadvantaged and handicapped. Of the fourteen area schools, one served more than a proportionate share of all disadvantaged and handicapped groups; three served at least a proportionate share of all five disadvantaged and handicapped groups; two served a proportionate share of four of the five disadvantaged and handicapped groups; three served at least a proportionate share of three of the five handicapped and disadvantaged groups; two served at least a proportionate share of two of the five disadvantaged and handicapped groups; and one served a proportionate share of only one of the five disadvantaged and handicapped groups. It also appears that the academically disadvantaged were being served proportionally by at least eleven of the area schools. All schools were proportionally serving minority groups. Nine of the schools were serving the economically disadvantaged proportionally as was the case for serving the mentally handicapped. The physically handicapped were being served proportionally by eight of the schools. Secondly, there were significant differences between different program types relative to the proportion of disadvantaged and handicapped groups enrolled. Finally, there were significant differences between the percent of disadvantaged and handicapped enrollment in the same type of a program at different schools.

Chapter 30

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

This chapter presents a summary of the study, conclusions based on the findings and recommendations based on the conclusions.

SUMMARY

Some Americans, for various reasons, are finding it difficult to acquire sufficient knowledge or skills for employment in a highly technical society. Included in this group, who are having problems preparing for skilled employment, are persons from minority groups, economically and academically disadvantaged individuals or persons who are mentally or physically handicapped.

Improvement of employment opportunities and hence economic conditions for handicapped and disadvantaged groups has been a major domestic issue during the last decade and a half. During President Nixon's administration, there has been a continuing emphasis on vocational education as part of the solution to this problem. Legislation has been passed during this period to provide specific funds for the training of the disadvantaged and handicapped.

Occupational training for the disadvantaged and handicapped presents special problems for the educational administrator. He has little information regarding the participation of disadvantaged and handicapped individuals in regular vocational programs and therefore has difficulty identifying the special needs of these people. The vocational education administrator must, as a consequence, often make decisions without sufficient background data.

The purpose of this study was to examine the participation rates of minority groups, economically disadvantaged groups, academically disadvantaged groups and mentally or physically handicapped groups in vocational education conducted at the fourteen area vocational and technical schools in Kansas.

The participation rates were analyzed in light of the numbers of disadvantaged or handicapped persons in the geographic area served by the area schools and in terms of program type versus program type and program versus program of a single type in the different schools.

Two populations were involved in this study, i.e., the population of students in Kansas' fourteen area vocational and technical schools and the population of citizens served by these area schools. The samples used to represent these populations consisted of the entire populations. This was made possible through the use of U.S. Census data and the Kansas Student Accounting System.

Data collection procedures were designed by the K-MUST staff in the summer and fall of 1972. The basic instrument was an optical scan form designated the VE-50 by the Kansas State Department of Education. Each vocational student in the area schools completed one of these forms under the supervision of a teacher and the data were used to generate a student data base. The Kansas State Department of Education made this data base available for this study.

The statistical tool used in this study was the Chi Square Test for Independence. The group membership was related to being or not being in a specific handicapped or disadvantaged group while criterion sets are general population versus students in the area schools, enrollment in particular programs and enrollment in programs within program type.

The first five hypotheses involved the comparison of area school students and the general population relative to proportions of disadvantaged and handicapped persons. Each hypothesis was related to a particular disadvantage or handicap. To test a single one of these hypotheses, fourteen Chi Square Tests were conducted (Note: One test for each school). The hypotheses were stated in a positive sense, i.e., there was a significant difference in the populations. When a significant number of the fourteen Chi Square Tests were retained, the hypothesis was retained.

The second five hypotheses involved the comparison of different types of programs relative to the proportion of disadvantaged and handicapped persons. Again, each of the hypotheses was related to a specific disadvantage of handicap. To test one of these five hypotheses, a single Chi Square test was used. The group membership was belonging or not belonging to a particular

handicapped or disadvantaged group while the criteria were enrollment in particular types of training programs.

The final five hypotheses involved the comparison of programs of the same type relative to enrollment of disadvantaged and handicapped groups. Each hypothesis was related to a particular type of disadvantage or handicap. Ninety Chi Square tests were used to evaluate a single hypothesis (Note: One for each program type). When a significant number of the tests were retained, the hypothesis was retained.

A computer program was developed to analyze the 525 Chi Square Tests used to evaluate the hypotheses examined in this study. This program may be found in Appendix L.

All of the fifteen hypotheses were retained. First, there were significant differences between the proportion of disadvantaged and handicapped students in the area schools and the proportion of disadvantaged and handicapped persons in the areas being served by the area schools. When the percent of disadvantaged or handicapped enrolled in an area school is equal to or greater than the percent of disadvantaged or handicapped in the general population, then that area school is said to serve a proportionate share of the disadvantaged and handicapped. Of the fourteen area schools, one served more than a proportionate share of all disadvantaged and handicapped groups; three served at least a proportionate share of all five disadvantaged and handicapped groups; two served a proportionate share of four of the five disadvantaged and handicapped groups; three served at least a proportionate share of three of the five disadvantaged and handicapped groups; two served at least a proportionate share of two of the five disadvantaged and handicapped groups; and one served a proportionate share on only one of the five disadvantaged and handicapped groups. It also appears that the academically disadvantaged were being served proportionally by at least eleven of the area schools. All schools were proportionally serving minority groups. Nine of the schools were serving the economically disadvantaged proportionally as was the case for serving the mentally handicapped. The physically handicapped were being served proportionally by eight of the schools. Secondly, there were significant differences between different program types relative to the proportion of disadvantaged and handicapped groups enrolled. Finally, there were significant differences between the percent of disadvantaged and handicapped enrollment in a particular program and the percent of disadvantaged

and handicapped enrollment in a particular program and the percent of disadvantaged and handicapped enrollment in the same type of a program at different schools.

CONCLUSIONS

1. It is possible for the disadvantaged and handicapped to enroll in regular vocational and technical programs in representative numbers.

2. Proportionate enrollment of the disadvantaged and handicapped (relative to the percent of disadvantaged and handicapped in the general population being served) has been achieved by some schools and not by others.

3. Different schools seem to have different policies (formal or informal) regarding the recruitment and enrollment of disadvantaged and handicapped students.

4. The academically disadvantaged are concentrated in programs such as Horticulture, Production Agriculture, Agriculture Mechanics, Auto Mechanics, and Diesel Mechanics. All of these programs seem to be in areas where there is considerable working with the hands.

5. Non-white individuals seem to be concentrated in cooperative programs, medical services, clothing production, child care, and food production. All of these programs would appear to be training for occupations which are service oriented and of a lower paying variety.

6. The economically disadvantaged appear to be concentrated in programs like Agriculture and Cooperative programs.

7. The mentally handicapped appear to be concentrated in Agriculture occupations, Food Service, and cooperative education programs. These program types all have areas where persons with limited mental capabilities can prepare for employment.

8. The physically handicapped appear to be concentrated in areas such as Drafting, Electronics, Electrical Repair, and Management Training. It should be noted that these programs are not necessarily preparing for physically demanding occupations.

9. The disadvantaged and handicapped may enroll heavily in a program of a certain type in one school and not constitute a heavy enrollment in that same type of program in other schools. In other words, there probably is

some selection procedure exercised by school officials and these selection procedures are not uniform across the state.

RECOMMENDATIONS

1. The State Department of Education should clarify definitions used to identify the academically disadvantaged in the Kansas Student Accounting System.

2. Research on the disadvantaged and handicapped should be continued in the areas of ability to complete training and ability to acquire employment after completion.

3. If it is deemed desirable to enroll the disadvantaged and handicapped in regular programs, a state wide policy should be developed which would serve as a guideline for recruitment and enrollment.

4. If it is deemed desirable to disburse funds to support training of all disadvantaged and handicapped students, some of the monies set aside should be used to provide special services for the disadvantaged and handicapped enrolled in regular vocational and technical programs. Examples of special services for the disadvantaged and handicapped are (1) tutoring services, (2) pre-vocational programs, (3) teacher aides who work exclusively with the disadvantaged and handicapped, (4) special equipment and/or facilities for exclusive use of the disadvantaged, (5) special guidance and placement services, and (6) the development of individualized instruction for disadvantaged and handicapped individuals.

5. If disadvantaged and handicapped funds are dispursed to support regular programs, the funds should be allocated on the basis of numbers of disadvantaged and handicapped students enrolled in the regular programs.

Part 7

A COST/BENEFIT ANALYSIS OF TRAINING PROGRAMS IN KANSAS'
FOURTEEN VOCATIONAL AREA SCHOOLS

Jack Brace De Vore, Jr.

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Chapter 31

INTRODUCTION

OVERVIEW

The 1968 Vocational Education Amendments require that vocational and technical training prepare students for jobs that either exist presently or will exist in the near future.¹ Implicit in this legislation is the need for graduates to benefit from their vocational training in terms of better jobs and higher salaries. Also implicit is that society benefit by receiving trained individuals whose productivity potential has been increased through vocational or technical education.

Cost/benefit analysis is one realistic way of evaluating what the net benefits of vocational or technical training to the individual or to society might be. There is a distinct difference between the benefits accruing to individuals and the benefits accruing to society. The individual would possibly benefit from such personal factors as social prestige and job satisfaction as well as the more objective factor of salary. On the other hand, societal benefits can be more objectively measured since they relate to productivity increases.

NEED FOR THE STUDY

The Division of Vocational Education of the Kansas State Department of Education has requested that a simple model be developed to determine payback period and accrued long run benefit for various training programs. Because data are relatively more available, the model will be tested using the fourteen area vocational technical schools (AVTS's).

It is assumed that there is a need for a cost/benefit study which compromises between simplicity and complexity. The trade-offs were resolved in favor of simplicity whenever and wherever distortion of results could be held to a minimum. The reasons for this trade-off preference were (1) so

that other programs not in area schools could be easily examined as data becomes available, and (2) so that as many individuals as possible could understand the rationale behind the technique.

In addition, the analysis of area school programs will answer a pressing and immediate need for data to influence legislative action and program planning.²

STATEMENT OF THE PROBLEM

The study attempted to answer the question, "Does the type and/or location of vocational programs influence the societal accrued long run benefits and societal payback periods?"

ASSUMPTIONS

The study was based on the following assumptions.

1. An individual's productivity was indicated by his salary.
2. A training program will have directly benefited only those graduates who were employed in a field related to training.
3. Individuals who did not take vocational training will be productive at approximately the Kansas average salary level for high school graduates who did not go on to college, trade school, etc.
4. Foregone productivity can be measured in terms of the Kansas average wage for high school graduates.
5. The average age of area school vocational program enrollees is approximately eighteen years.
6. The average salary of a particular type of worker is applicable to workers of that type trained by vocational programs.
7. Interest rates and inflation will be roughly balanced over the next forty-seven years and therefore discount rates need not be considered. This assumption was based on an examination of inflation and interest rates from 1932 through 1972.

LIMITATIONS

The study was subject to the following limitations.

1. The study was restricted to a societal analysis and did not consider indirect benefits to the individual.
2. The study was restricted to the programs found in Kansas' fourteen area schools for which data was available.
3. Employment in the field related to training was determined by a follow-up conducted four and a half months after completion of training.
4. Program costs were based on the 1972 Fiscal Year Budget.

HYPOTHESES TESTED

The following hypotheses will be statistically tested in this study.

1. There is no significant difference between payback periods for the different program types in the fourteen area schools in Kansas.
2. There is no significant difference between the accrued long run benefits from the different vocational program types in the fourteen area schools in Kansas.
3. There is no significant difference in the payback periods for vocational programs in the different area schools in Kansas.
4. There is no significant difference in the accrued long run benefits for vocational programs in the different area schools in Kansas.

Chapter 32

BACKGROUND INFORMATION AND REVIEW OF RELATED LITERATURE

INTRODUCTION

The purpose of this chapter is to examine background information that identifies, defines and/or explains the major concepts found in this study.

DEFINITIONS

Accrued Long Run Benefits

The accrued long run benefits refer to the lifetime productivity of vocational program graduates who were employed in their training field less the cost of training and expected productivity of a non-vocational graduate. The "long run" adjective refers to the forty-seven year period from high school graduation to retirement.

Accumulated Productivity

Accumulated productivity is the total productivity of an individual over a given period. Accumulated productivity for the non-vocational graduate and the vocational graduate who did not receive employment in a field related to his training is estimated as the Kansas average productivity of high school graduates. Gender will be considered when determining accumulated productivity for non-vocational graduates and vocational graduates who did not receive employment in a field related to their training. The accumulated productivity for the vocational graduate who is employed in a field related to this training will be estimated as the Kansas average productivity of a worker in that field.

Agribusiness Technology

Agribusiness technology is defined as planned learning activities which

are concerned with farm resource analysis, accounting, production, financing resource acquisition, purchasing, farm inputs, performance records, contracts, farm marketing and maintenance. The results of these learning activities are applied to formulating decisions involved in managing a farm or ranch operation.¹

Agricultural Diesel Mechanics

Agricultural diesel mechanics is defined as a combination of subject matter and experiences designed to develop in pupils the abilities to (1) recognize and identify the fundamental principles of selection, operation, service maintenance, repair, and safety in agricultural power--engines, electricity, and hydraulics, and (2) plan, install, service, assemble, adjust, operate, and repair farm machinery.²

Agriculture Chemical Technology

Agriculture chemical technology is defined as the study of a variety of chemicals, drugs, and related products which are associated with the production of animals and plant products. Usually included for study are various types of chemicals used to prevent, control, or cure animal and plant diseases and to control pests.³

Air Conditioning and Refrigeration

Air conditioning and refrigeration is defined as classroom and shop experiences which enable the student to become proficient in the installation, repair, and maintenance of commercial, industrial, and domestic air conditioning systems. Included is instruction in the theory and application of basic principles involved in conditioning of air: cooling, heating, filtering, and controlling humidity; the operating characteristics of various units and parts; blueprint reading; the use of technical reference manuals; the diagnosis of malfunctions; the overhaul, repair, and adjustment of units and parts such as pumps, compressors, valves, springs, and connections, and the repair of electric and pneumatic control systems.⁴

Air Frame and Power Plant

Air frame is defined as specialized classroom and shop experiences

concerned with the maintenance and repair of all airplane parts other than engines, propellers, and instruments. Training emphasizes the layout and fabrication of sheet metal and other materials into parts, fittings, and structural members assembly and installation of structural members; equipment and mechanical parts; and the disassembly and replacement of damaged or worn parts. Training prepares the pupil for the Federal Aviation Agency examination for the air frame mechanic's license.

Power plant is defined as specialized classroom and shop experiences concerned with the maintenance and repair of all types of power plants for aircraft. Course work includes engine inspection and maintenance; lubrication and cooling; electrical and fuel systems; and propellers. Training prepares the pupil for the Federal Aviation Agency examination for the power plant mechanic's license.⁵

Appliance Repair

Appliance repair is defined as classroom and shop experiences concerned with the theory of electrical circuitry, simple gearing, linkages, and lubrication in the operation, maintenance, and repair of components including relays, time switches, pumps, and agitators used in appliances such as washers, dryers, vacuum cleaners, toasters, water heaters, and stoves. Related training is provided in the uses of familiar tools, test equipment, and service manuals, and in making cash estimates for repairs.⁶

Auto Mechanic

Auto mechanics is defined as learning experiences concerned with the components of the vehicle, including engine, power transmission, steering, brakes, and electrical systems. Included is training in the use of diagnostic and testing equipment and tools used in the repair process.⁷

Auto Body Repair

Auto body repair is defined as specialized learning experiences concerned with all phases of repairing damaged bodies and fenders including metal straightening by hammering, smoothing areas by filing, grinding or sanding, concealment of imperfections, painting, and replacement of body components, including trim.⁸

Bricklaying

Bricklaying is defined as specialized classroom and shop experiences concerned with the cutting, chipping, and fixing in position of concrete blocks, brick, and glass blocks using bonding materials and hand tools. Included is training in reading architectural plans, planning, and estimating.⁹

Business Cooperative

Business cooperative is defined as the subject matter designed to make available to all pupils an introductory study of business, including (1) an understanding and appreciation of the nature, scope, and functions of the business-economic system in meeting consumer needs and wants; (2) an understanding of economic principles and desirable business practices which should be followed by consumers in the wise handling of their business affairs; and (3) an understanding and appreciation of career opportunities which are to be found in business occupations. This course may have other titles, such as Introduction to Business or Basic Business. The subject matter of this course has value for all pupils as members of the economic community.¹⁰

Business Data Processing

Business data processing is defined as planned learning activities which include a combination of courses and practical experiences concerned with business data processing systems and operations.¹¹

Cabinetmaking and Millwork

Cabinetmaking and millwork is defined as specialized class and practical work experiences concerned with mass production of products such as window frames, moldings, trim, and panels; and with making such products as furniture, store fixtures, kitchen cabinets, and office equipment. Instruction includes training in cutting, shaping, and assembling parts by means of hand tools and woodworking machines; refinishing furniture; installation of hardware, e.g., hinges, catches, and drawer pulls; planning layouts; blueprint reading; drafting; and various kinds of woods.¹²

Carpentry

Carpentry is defined as classroom and shop experiences involving layout,

fabrication, assembly, installation, and repair of structural units. Emphasized in instruction are the care and use of hand tools; equipment and materials, common systems of frame construction and the principles involved; and drafting, blueprint reading, applied mathematics, and materials estimating.¹³

Child Care

Child care is defined as the preparation for various kinds of employment related to child care centers and young children, e.g., assisting directors of child day-care centers, or nursery schools, assisting with activities on playgrounds and in recreation centers, and caring for children in homes and in such public places as stores, playgrounds, recreation centers, and transportation terminals.¹⁴

Civil Technology

Civil technology is defined as planned program of classroom and laboratory experiences including the study of physical sciences, mathematics, surveying, strength of materials, and other speciality courses leading to preparation for designing, testing, and supervising the construction of highways, railroads, airports, bridges, harbors, irrigation works, sanitary plants, and other structures. The graduate works in direct support of the civil engineer.¹⁵

Commercial Art and Artist

Paste-Up

Commercial art and artist paste-up is defined as organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to the design and execution of layouts and making illustrations for advertising theory and preparation of copy, lettering, poster design, fashion illustration, silk screen, air brush and touchup, inks and color dynamics, package and product design, drawings for line and halftone reproduction, and other display devices and exhibits. Instruction leads to preparation for various types of employment such as fashion illustrator, technical illustrator, interior decorator, and advertising artist.¹⁶

Communications Technology

Communications technology is defined as specialized classroom and

practical experiences concerned with the assembly, installation, operation, maintenance, and repair of communications equipment and systems of all types, e.g., industrial and entertainment sound systems, data processing, telephone dial systems, two-way radio, central circuits, hearing aids, and high-fidelity receiving sets.¹⁷

Cosmetology

Cosmetology is defined as classroom and practical experiences concerned with a variety of beauty treatments, including the care and beautification of the hair, complexions, and hands. Instruction includes training in giving shampoos, rinses, and scalp treatments; hair styling, setting, cutting, dyeing, tinting, and bleaching; permanent waving; facials; and manicuring and hand and arm massaging. Bacteriology, anatomy, hygiene, sanitation, salon management (including keeping records), and customer relations are also emphasized. Instruction is designed to qualify pupils for the licensing examination.¹⁸

Cost of Training

Cost of training is the program cost divided by the number of graduates who are employed in a field in which they were trained.

Cost/Benefit Model

The cost/benefit model is a graphic illustration used to determine payback periods and accrued long run benefits.

Cycle and Small Engine Mechanic

Cycle and small engine mechanic is defined as classroom and shop experiences concerned with maintaining and repairing a variety of small engines used on portable power equipment, e.g., lawnmowers, outboard motor boats, chain saws, and rototillers. Instruction includes principles of internal-combustion engine operation, reading technical manuals, and customer relations.¹⁹

Dental Assistant

Dental assistant is defined as a combination of subject matter and

experiences designed to prepare a person to assist the dentist at the chair-side in the dental operator, to perform reception and clerical functions, and to carry out selected dental laboratory work.²⁰

Dental Hygienist

Dental hygienist is defined as a combination of subject matter and experiences designed to prepare a person to provide services to patients such as performing complete oral prophylaxis, applying medication, and providing dental health education services, both for chair-side patients and in community health programs, under the supervision of the dentist.²¹

Diesel Mechanic

Diesel mechanic is defined as classroom and shop experiences which are concerned with all phases or repair work on diesel engines used to power buses, ships, trucks, railroad trains, electric generators, construction machinery, and similar equipment. Instruction and practice are provided in the diagnosis of malfunction; disassembly of engines and examination of parts; reconditioning and replacement of parts; repair and adjustment of fuel injection systems, oil and water pumps, generators, governors, auxiliary and accompanying power units, controls, and transmissions. The uses of technical manuals, a variety of hand and power tools, and testing and diagnostic equipment are also studied.²²

Drafting

Drafting is defined as organized specialized learning experiences which emphasize theory, use of the drafting room, and laboratory and shopwork as each relates to gathering and translating data or specifications, including the aspects of planning, preparing, and interpreting mechanical, architectural, structural, pneumatic, marine, electrical/electronic, topographical, and other drawings and sketches. Instruction is designed to provide experiences in drawing; in the use of reproduction materials, equipment, and processes; the preparation of reports and data sheets for writing specifications; the development of plan and process charts and drawings; and the development of models.

Instruction emphasizes the development of skills and knowledge essential for employment in ancillary capacities such as tracers or reproduction equipment operators, and for occupations such as mechanical draftsmen, structural

draftsmen, detailer, marine draftsmen, tool designer, fixture designer, and punch and die designer.²⁴

Electricity

Electricity is defined as classroom and shop experiences concerned with the layout, assembly, installation, testing, and maintenance of electrical systems. Instruction is provided in the reading, interpretation, and understanding of residential, commercial, and industrial wiring based on controlling electrical codes.²⁵

Electronics

Electronics is defined as organized specialized learning experiences which include theory, laboratory, and shopwork as each relates to planning, producing, testing, assembling, and installing and maintaining electronic communications equipment such as radio, radar, and television; industrial electronic equipment, including digital computers; new electronic systems, components, and equipment; and control devices. Emphasis is on solid-state devices and components, electron tube characteristics, low-frequency amplifiers, LC and RC oscillators, transistors, and amplitude and frequency modulation. Instruction is designed to develop knowledge, understanding, and skills essential for employment in communications, industrial electronics, radio/television, and other electronics occupations.²⁶

Farm and Ranch Management

Farm and ranch management is defined as a combination of subject matter and practical experiences designed to develop knowledge and skills concerned with farm and ranch management; determining cropping systems and fertilizer; conditioning; and cultural practices that will result in efficient agricultural production.²⁷

Farm Equipment Mechanics

I & II

Farm equipment mechanics (I & II) is defined as a combination of subject matter and activities designed to develop abilities necessary for assisting with and/or performing the common and important operations or

processes concerned with the selection, operation, maintenance, and use of agricultural power, agricultural machinery and equipment, structures and utilities, soil and water management, and agricultural mechanics shop, including kindred sales and services.²⁸

Feed Industry Technology

Feed industry technology is defined as the study of the principles concerned with the analysis, sale, and application of chemical elements known to be necessary for plant growth.²⁹

Feedlot Management

Feedlot management is defined as the study of the business of processing and distributing feeds and feedstuffs and feedlot management.³⁰

Foods Management

Foods management is defined as the study of food and its role in personal and family living, including the basic principles of health, food management, and economics. In practice, emphasis is frequently placed on meal management as a means of understanding the significance and nature of food, its care, and its preparation for individuals and families.³¹

Foregone Productivity

Foregone productivity is that wage that was not received by the individual because he was in training.

Heavy Equipment

Heavy equipment is defined as specialized classroom and practical work experiences concerned with the uses, care, and operation of a variety of earthmoving equipment such as crawler tractors, motor graders, and motor scrapers; shovels, including dragline and hoe; and cranes. Instruction provides for experiences in digging, ditching, sloping, stripping, grading, back filling, clearing, and foundation excavating.³²

Instrumentation Technology

Instrumentation technology is defined as a sequence of classroom and

laboratory experiences, supported by physical sciences and mathematics, concerned with providing an understanding in the fields of electricity, electronics, mechanics, pneumatics, and hydraulics as they pertain to applications of the principles of control and recording systems and automated devices. The instructional program is planned to prepare the pupil to design, develop prototypes, and test and evaluate control systems or automated systems and to prepare graphs, written reports and test results in support of the professional personnel working in the field of instrumentation.³³

Length of Training

The length of training refers to the length of training programs expressed in years.

Machine Shop

Machine shop is defined as specialized classroom and shop experiences concerned with all aspects of shaping metal parts. Instruction involves making computations relating to work dimensions, tooling, feeds, and speeds of machining. Also emphasized are: work on the bench, and on lathes, shapers, milling machines, grinders and drills, the uses of precision measuring instruments such as layout tools, micrometers, and gages; methods of machining and heat treatment of various metals; blueprint reading; and the layout of machine parts. Instruction prepares the pupil to operate and repair all machines.³⁴

Medical Lab Assistant

Medical lab assistant is defined as a combination of subject matter and experiences organized to prepare a person to work under the supervision of medical technologists, clinical pathologists, or physicians to perform routine clinical laboratory procedures.³⁵

Nurse Assistant

Nurse assistant is defined as a combination of subject matter and experiences which prepares a person to perform simple tasks involved in the personal care of individuals receiving nursing services.³⁶

Nurse Associate Degree

Nurse associate degree is defined as a combination of general and nursing education and clinical experiences designed to prepare a person for general duty nursing under the nurse supervisor or physician, or with other members of the health team.³⁷

Nursery Management and Landscape Planning

Nursery management and landscape planning is defined as organized subject matter and practical experiences which are concerned with the principles and practices involved in locating, planting, and maintaining turf, plants, shrubs, or devices for the beautification of home grounds and other areas of human habitation and recreation.³⁸

Ornamental Horticulture

Ornamental horticulture is defined as organized subject matter and practical experiences concerned with the culture of plants used principally for ornamental oresthetic purposes. Instruction emphasized knowledge and understanding important to establishing, maintaining, and managing ornamental horticulture enterprises.³⁹

Other Medical Laboratory Technician

Other medical laboratory technician is defined as other organized subject matter and experiences emphasized in occupations, not listed or classifiable above, which are concerned with medical laboratory technology.⁴⁰

Payback Period

Payback period refers to the time it will take for increased productivity of vocational graduates to return society's investment.

Photography

Photography is defined as the study of the tools, materials, and processes used in photography with emphasis on industrial uses. Learning activities include experiences using cameras, developing negatives, and making contact prints, enlargements, and mountings.⁴¹

Plastics

Plastics is defined as the study of the tools, materials, and processes used in several facets of the plastics industry. Learning experiences include experimenting, designing, machining, fabricating, forming, and evaluating plastics and plastic products.⁴²

Police Science

Police science is defined as a planned sequence of classroom instruction and laboratory experiences designed to prepare a student to function as one or more of the following: (1) a generalist in any law enforcement agency concerned with patrol and investigative activities, traffic control, initial contact with the public such as obtaining information, preparing reports, and testifying in court; (2) an evidence technician operating in a crime laboratory or mobile unit concerned with the collection preparation, and transportation of physical evidence--including the use of skills in photography and report writing; and (3) a technician--primarily concerned with delinquency or crime prevention--who may be employed by a police agency, juvenile court, or correctional institution to (a) carry out responsibilities which may include investigation and referral of dependent-neglected children as well as delinquents and youthful offenders, (b) supervise persons on probation, or (c) provide rehabilitative services to offenders.⁴³

Practical Nurse

Practical nurse is defined as a combination of subject matter and supervised clinical experiences designed to prepare a person to give direct nursing care under the supervision of a nurse or physician.⁴⁴

Printing

Printing is defined as photographic printing chases that imprints pattern of aperture masks, used in color kinescope tubes, on sensitized steel: Feeds specified section of sensitized steel from roll between two photographic plates in chase. Moves controls to close chase and create vacuum, forcing plates against steel. Verifies alignment of plates, using microscope gage. Sets timer for specified exposure time and turns on heliarc lamp to imprint pattern of aperture mask from photographic plate onto steel.⁴⁵

Production Agriculture (I & II)

Production agriculture (I & II) is defined as subject matter and learning activities which are concerned with the principles and processes involved in the planning related to and the economic use of facilities, land, water, machinery, chemicals, finance, and labor in the production of plant and animal products. Activities include classroom instruction and laboratory experiences in and out of school, including farms, ranches, and other agriculturally related establishments.⁴⁶

Productivity

Productivity is the products or services produced by an individual. It is measured by the wage earned by the individual.

Program

Program is the uniqueness of a course of occupational study at a specific school; e.g., all classes offered at any Kansas AVTS for the training of welders.

Program Type

Program type is occupational training generalized to describe similar program types at all schools under study; e.g., all Kansas AVTS welding classes.

Radio and TV Repair

Radio and TV repair is defined as specialized theory and practice which are concerned with the construction, maintenance, and repair of radios and television sets. Training also prepares pupils to diagnose troubles and make repairs on other electronic products such as high-fidelity sound equipment, phonographs, and tape recorders.

Sheet Metal and Fabrication

Sheet metal and fabrication is defined as specialized classroom and shop experiences concerned with the layout, fabrication, erection or installation, and maintenance of items made of steel, copper, stainless steel, and aluminum such as ventilating, air conditioning, and heating ducts, kitchen equipment, signs, furniture and skylights. Instruction emphasizes the use

of handtools and machines such as the cornice brake, forming rolls, and squaring shears; drafting; blueprinting reading.⁴⁸

Societal Analysis

Societal analysis is the interpretation of the effects of occupational education on the state economy.

Successful Graduate

A successful graduate is a graduate employed in the field for which he was trained.

Truck Driving

Truck driving is defined as a term applied to workers who drive trucks to transport materials, merchandise, equipment, or men. Loads and unloads trucks by hand, or by use of mechanical devices, such as hoists, pumps, lifts, or winches. May lubricate truck or make minor repairs.⁴⁹

Welding

Welding is defined as the study of the operations used in cutting and fabricating metal products by welding techniques.⁵⁰

HISTORICAL BACKGROUND

Cost/benefit analysis is a relatively new phenomenon on the national scene. The first significant study in this area was conducted by Denison in 1962.⁵¹

Since this time, there have been approximately 100 further studies published with the vast majority conducted in the late 1960's.

Warmbrod⁵² indicated that cost/benefit studies of public school programs of vocational and technical education are in an embryo stage and have many limitations. One of the major conclusions from the research done to date is that vocational education is a sound investment for society.

At this time, there has been no attempt, that has been published, to conduct a cost/benefit analysis of vocational and technical training in the state of Kansas. The Kansas State Department of Education has expressed a

need for data pertaining to the cost/benefit of vocational and technical programs. The Kansas State Department of Education will utilize the data obtained in this study as a source for their program application evaluation system.⁵³

Relative to utilization of this type of data for decision-making, Warmbrod states:

Data pertaining to economics of vocational and technical education will lean heavily on policy decisions about occupational education including the question of what agencies, public schools or otherwise, can conduct occupational education programs most efficiently.⁵⁴

REVIEW OF RELATED LITERATURE

A limited amount of research has been directed toward cost/benefit of the area vocational-technical schools. Schriver and Bowlby⁵⁵ analyzed the Tennessee Area Vocational Technical School System in search of the following data: (1) Economic justification of vocational training; (2) wage differences among the vocationally trained and non-trained; (3) internal rate of return to area vocational-technical schools.

The data collected were organized into tabular form and some of the findings included; (1) vocational training reduced unemployment, increased labor force participation and increased occupational mobility, (2) low educational ability students received the greatest rate of return from vocational education, (3) vocational education was beneficial regardless of educational attainment, (4) the public rate of return on investments in vocational training was 6.3 percent, and (5) the private rate of return in investments in vocational training was 13.4 percent.

Kraft⁵⁶ conducted a cost effectiveness analysis of vocational-technical education programs in Florida. This study was concerned with data of an empirical nature regarding the public and private cost, as well as some utility aspects of vocational-technical education at two educational centers.

The purpose of the study was to gain data pertaining to: (1) occupational objectives of programs offered; (2) the degree of attainment of occupational objectives by graduates in terms of earnings levels; (3) a cost-effectiveness ratio; (4) a simulation model with respect to optimizing a number of interacting variables.

Kraft's study was preceded by a review of literature. Cost-utility

was discussed as an emerging concept. The study further considered the cost-benefit role in planning, programming, budgeting systems and cost-utility systems in school administration.

Kaufman and Lewis⁵⁷ selected three cities and conducted an in-depth study to ascertain recommendations for improvement of vocational education. The study found that; (1) most students enter the work force with a lack of specialized training, (2) vocational programs had a higher enrollment when students were taught in comprehensive schools, (3) there is an imbalance in the enrollment in vocational programs, (4) smaller city enrollments are more closely related to the needs of the labor force, (5) graduates of vocational programs did not recall being contacted by counselors, (6) characteristics found to be true of vocational graduates were higher employment stability, increased earnings faster, and higher average monthly earnings, (7) the cost of vocational education can be justified by their earnings, (8) less than one-half of the male vocational graduates received jobs directly related to their training.

With the conclusion of their study the authors recommended; (1) the development of programs that include broad general skills with general application, (2) vocational programs be tailored to encompass the student that does not see a need in either vocational or academic curriculum, (3) programs be based on relevance and interest, (4) the curriculum include employment exploration and familiarization, and (5) vocational guidance be expanded.

Goishi⁵⁸ conducted a research project to estimate the net relationship between the enrollment size and the expenditures per student of sixteen share-time Missouri vocational technical schools. Each school in the study had permanent separate plant facilities and was confined to the regular day programs offered to full time high school day students. Data were collected by personal interviews and were statistically analyzed by use of a multiple regression model. The author concluded; (1) the number of students enrolled in a program is the single most common factor contributing to expenditure, (2) administrative cost played an important role in the cost of operating programs, (3) the kinds and amounts of equipment utilized were also major factors contributing to operational cost.

In order to develop criteria for selecting a building site for vocational schools, Bestor⁵⁹ gathered data from both a review of literature and a

questionnaire survey. The author discovered that there was a wide variation in criteria for selecting a building site. However, five areas of concern were identified; (1) potential enrollment, (2) finances, (3) local support and initiative, (4) employment of graduates, and (5) school location and other services relationship.

Carroll and Ihnen⁶⁰ conducted an investigation in which the objectives were; (1) to obtain estimates of costs and returns of technical education, (2) to compute private as well as social rates of returns on investments, (3) to compare the rates of return on investments of vocational programs with that rate of return on investment of general education. It was found that the education obtained by the technical graduate paid a higher rate of return than did the education obtained by the high school graduate even if only the pecuniary returns are considered. The investigators also expressed that if the indirect and non-monetary return could have been accurately measured, the social and private rates of return would have been even higher.

Katzenbach⁶¹ found that due to the continuous change in education, administrators need to become familiar with a more up-to-date budgeting system. This familiarization will aid in the precise prediction of future budget needs in the future. Outlined in this study was the "Planning Programming Budgeting System" and it was noted that this system delineates program integration and highlights alternatives in a new way by aligning objectives and costs.

Kaufman⁶² presented a paper in which he approached cost-benefit analysis in terms of; (1) logic and meaning of cost-benefit analysis, (2) misconceptions of cost-benefit analysis, (3) the meaning of evaluation, (4) resistance to evaluation, and (5) objectives of cost-effectiveness study. Kaufman states that the study of cost-effectiveness of vocational education has two basic objectives. The first objective is to design the proper methodology for a cost-benefit study. The second objective is to insure that the study obtains the appropriate data and to indicate direction of results.

SUMMARY

Cost/benefit studies are a relatively new phenomenon on the national education scene. Literature indicates that the findings of the approximately 100 significant studies to date are limited and the only conclusion that can

be drawn at this time is that vocational education is a sound investment for society. The state of Kansas has a recognizable lack of research relative to cost/benefit of vocational education.

Some of the more significant studies found that the:

1. Program budgeting should be based on cost/benefit analysis of programs.
2. Cost of vocational education can be justified due to extra wages earned by vocational program graduates.
3. Number of students enrolled is the most significant factor contributing to cost.
4. Vocational training reduces unemployment.
5. Low educational ability students receive the greatest rate of return from vocational education.

FOOTNOTES

¹U.S. Department of Labor, Vocational Education and Occupation, (Washington: Government Printing Office, 1969), p. 6.

²Ibid., p. 18.

³Ibid., p. 7.

⁴U.S. Office of Education (comp. ed.) Standard Terminology for Instruction in Local and State School Systems, (Washington: Government Printing Office, 1970), p. 229.

⁵Ibid., pp. 229-230.

⁶Ibid., p. 229.

⁷Ibid.

⁸Ibid.,

⁹Ibid., p. 231.

¹⁰Ibid., p. 166.

¹¹U.S. Department of Labor, op. cit., p. 61.

¹²U.S. Office of Education, op. cit., p. 238.

¹³Ibid., p. 231.

¹⁴Ibid., p. 195.

¹⁵Ibid., p. 224.

¹⁶Ibid., p. 230.

¹⁷Ibid., p. 232.

¹⁸Ibid., p. 235.

¹⁹Ibid., p. 237.

²⁰Ibid., p. 185.

²¹Ibid.

²²Ibid., p. 232.

- ²³Ibid., p. 172.
- ²⁴Ibid., p. 232.
- ²⁵Ibid., p. 231.
- ²⁶Ibid., p. 232.
- ²⁷U.S. Department of Labor, op. cit., p. 13.
- ²⁸Ibid., p. 8.
- ²⁹Ibid., p. 7.
- ³⁰Ibid.
- ³¹U.S. Office of Education, op. cit., p. 194.
- ³²Ibid., p. 231.
- ³³Ibid., p. 225.
- ³⁴Ibid., p. 234.
- ³⁵Ibid., p. 186.
- ³⁶Ibid.
- ³⁷Ibid.
- ³⁸U.S. Department of Labor, op. cit., p. 13.
- ³⁹Ibid., p. 9.
- ⁴⁰U.S. Office of Education, op. cit., p. 186.
- ⁴¹Ibid., p. 225.
- ⁴²Ibid., p. 198.
- ⁴³Ibid., p. 225.
- ⁴⁴Ibid., p. 186.
- ⁴⁵U.S. Department of Labor, Dictionary of Occupational Titles, Vol. 1, Definitions of Titles, 3d ed. (Washington: Government Printing Office, 1965), p. 562.
- ⁴⁶U.S. Department of Labor, Vocational Education and Occupation, op. cit., p. 4.
- ⁴⁷Ibid., p. 132.

- ⁴⁸Ibid., p. 156.
- ⁴⁹U.S. Department of Labor, Dictionary of Occupational Titles, op. cit., p. 562.
- ⁵⁰U.S. Office of Education, op. cit., p. 198.
- ⁵¹Edward F. Denison, The Sources of Economic Growth in the United States and the Alternative Before Us, (New York: Committee for Economic Development, 1962), p. 297.
- ⁵²J. Robert Warmbrod, Consultant, Review and Synthesis of Research on the Economics of Vocational-Technical Education, ERIC, Clearinghouse, the Center for Vocational and Technical Education, (Columbus: Ohio State University, 1968), pp. 38-40.
- ⁵³Statement by R. B. Daniels, Program Administrator of Industrial Education, Kansas; personal interview, September 15, 1972.
- ⁵⁴Warmbrod, loc. cit.
- ⁵⁵William R. Schriver and Roger L. Bowlby, The Effects of Vocational Training on Labor Force Experience. An Analysis of the Tennessee Area Vocational Technical School System, (Murfreesboro, Tenn.: Vocational Curriculum Laboratory, 1971).
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- ⁵⁷Jacob J. Kaufman and Morgan V. Lewis, The Potential of Vocational Education Observations and Conclusions Based on a Study of Three Selected Cities in Pennsylvania, (Harrisburg: Pennsylvania State Department of Public Instruction, 1968).
- ⁵⁸Frank Hideo Goishi, The Relationship of Enrollment Size of Area Vocational-Technical Schools in Missouri to Per Student Expenditures for Vocational Education, University of Missouri, (University Microfilms, Inc., 1970).
- ⁵⁹Rollie Ray Bestor, A Determination of Selected Criteria to be Utilized in Locating and Establishing Area Vocational Education Schools in Utah. Final Report, (Washington: Office of Education, Bureau of Research, 1970).
- ⁶⁰U.S. Department of Labor, Costs and Returns of Technical Education: A Pilot Study, Adger B. Carroll and Loren A. Ihnen, (Washington: 1966).
- ⁶¹U.S. Department of Education, Edward L. Katzenbach, Planning Programming Budgeting Systems: PPBS and Education, The New England School Development Council, March, 1968.
- ⁶²Jacob J. Kaufman, Journal of Industrial Teacher Education, Vol. 6, No. 3, (American Technical Society, 1969).

Chapter 33

PROCEDURES

INTRODUCTION

The purpose of this chapter is to describe the procedures and tools used to evaluate the hypotheses presented in Chapter 31.

THE COST/BENEFIT MODEL

The model provides an estimate of the payback period by determining the intersection of a line representing the accumulated productivity of a non-vocational graduate and a line representing the accumulated productivity of a vocational graduate on a time (X Axis) and dollar (Y Axis) graph. The accumulated productivity of the vocational graduate is adjusted to reflect the cost of training and the foregone earning power while in training. Since the average productivity of a non-vocational graduate and the average productivity of a vocational graduate (from a specific type of training program) were compared in these calculations, the resulting payback period reflects the payback period of the particular program. The payback period was expressed in terms of years after high school graduation, e.g., it takes X years after high school graduation for the increased productivity of vocational graduates employed in a field related to training to counter-balance the cost of training and the foregone productivity of student in the program.

An estimate of the accrued long run benefits of the training program was determined by calculating the difference between the line representing the accumulated productivity of a vocational program graduate and the line representing the accumulated productivity of a non-vocational graduate when time equals forty-seven years after high school graduation.

The forty-seven year period was selected for use in this study because a typical high school graduate leaves high school at the age of eighteen and is assumed to retire at the age of sixty-five. This leaves forty-seven years

for an individual to be productive. It should be noted, however, that the forty-seven year figure may be altered to account for different periods of productivity.

A graphic example of this model is represented in Figure 17.

THE POPULATION

The population examined in this study consisted of the full time programs in all fourteen area schools in Kansas. Table 32 indicates the programs found in the various area schools for which data were available.

INSTRUMENTS

The Kansas State Department of Education reporting forms used to gather the data in this study were the:

1. VE 50 which was used to gather enrollment data.
2. VE 60 which was used to report follow-up data.

DATA COLLECTION

Data were collected from each of the five state program administrators in the summer and fall of 1972. The VE 50's and VE 60's were checked to determine male and female enrollments, number of graduates placed in a related field, and budgeting information.

The salary data on the various occupations were obtained from the 1970 Census of Population for Kansas.¹ These salaries were reported as median earnings (dollars) for persons working in that occupation in Kansas. The Kansas average annual salaries for the occupations and the types of training programs may be found in Table 33.

The expected annual average salary for persons in Kansas completing high school was derived from the median salary figures presented in 1970 Census of Population in Kansas.² For females, this figure was \$2,547, while for males the figure was \$6,726.

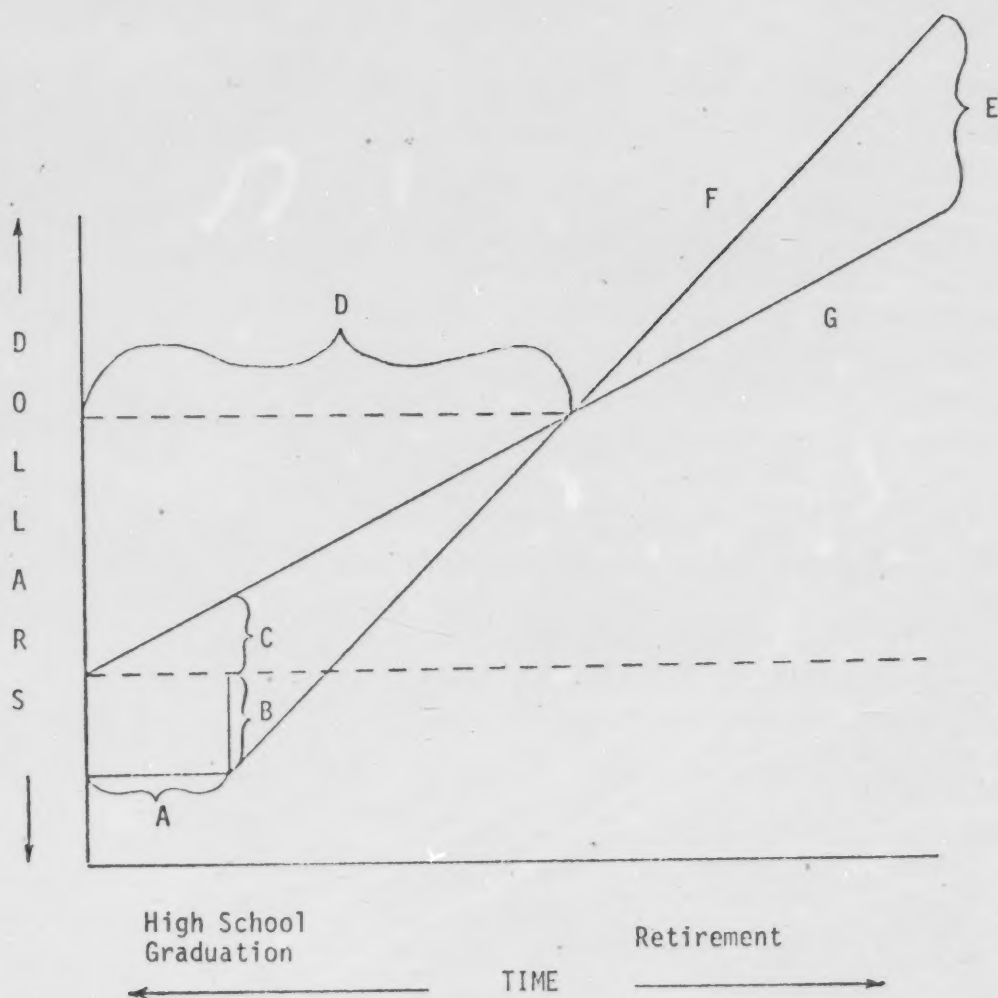


Table of Variables in the Model:

- A Length of Training
- B Cost of Training
- C Foregone Productivity
- D Payback Period
- E Accrued Long Run Benefits
- F Accumulated Productivity for Average Worker in the Field
- G Accumulated Productivity for Average High School Graduate

Figure 17
The Societal Cost/Benefit Model

Table 32

Program Offerings in the Fourteen Kansas
Vocational Technical Schools

Program Types	Vocational Technical School													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Agribusiness Technology													X	
Agricultural Diesel Mechanics								X						
Agriculture Chemical Technology	X													
Air Conditioning and Refrigeration	X	X	X		X									
Air Frame and Power Plant		X			X									
Appliance Repair												X		
Auto Body Repair		X			X									
Auto Mechanic	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bricklaying	X													
Business Data Processing			X				X		X			X	X	X
Cabinet Making and Millwork		X												
Carpentry	X	X		X		X	X				X	X	X	X
Child Care		X						X						
Civil Technology									X					
Commercial Art and Artist Paste-Up					X									
Communications Technology											X			
Cosmetology								X		X	X	X		

Table 32 (continued)

Program Types	Vocational Technical School													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cycle and Small Engine Mechanics									X					
D.E. Cooperative	X	X	X	X	X	X		X	X	X		X	X	X
Dental Assistant		X												
Dental Hygienist		X												
Diesel Mechanics	X				X						X			X
Drafting	X	X	X		X	X	X	X	X	X	X		X	
Electricity		X	X			X	X		X		X			X
Electronics					X	X	X	X			X		X	X
Farm and Ranch Management								X						X
Farm Equipment Mechanics (I & II)							X							
Feed Industry Technology								X						
Feedlot Management				X										
Food Management		X		X				X		X		X		
Heavy Equipment														X
Machine Shop	X	X		X	X	X		X	X	X		X	X	
Medical Lab Assistant		X												
Nurse Associate Degree												X		
Nursery Management and Landscape Planning									X					
Nurse Assistant	X			X	X	X		X		X		X		
Office Education	X	X		X	X	X	X	X	X	X		X		X
Ornamental Horticulture						X								

Table 32 (continued)

Program Types	Vocational Technical School													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Other Medical Lab Technicians										X				
Photography									X					
Plastics		X												
Police Science						X								X
Practical Nurse		X	X	X		X	X	X	X			X		X
Printing		X	X	X	X	X	X		X	X				
Production Agriculture (I & II)							X							
Radio and TV Repair								X	X			X		
Sheet Metal and Fabrication		X												
Truck Driving								X						
Welding	X	X		X	X		X	X	X			X	X	X

Table 33

Kansas Average Annual
Salaries for 1970a

Program Type	Kansas Average Annual Salary for 1970
Agribusiness Technology	7,612
Agricultural Diesel Mechanics	7,258
Agricultural Chemical Technology	7,612
Air Conditioning and Refrigeration	7,986
Air Frame and Power Plant	7,924
Appliance Repair	7,258
Auto Body Repair	6,293
Auto Mechanic	6,293
Bricklaying	7,964
Business Data Processing	9,593
Cabinetmaking and Millwork	6,696
Carpentry	6,318
Child Care	2,568
Civil Technology	7,612
Commercial Art and Artist Paste-Up	7,934
Communications Technology	7,612
Cosmetology	2,919
Cycle and Small Engine Mechanic	7,258

Table 33(continued)

Program Type	Kansas Average Annual Salary for 1970
*D.E. Cooperative	6,098
Dental Assistant	3,210
Dental Hygienist	4,765
Diesel Mechanic	7,258
Drafting	7,193
Electricity	7,964
Electronics	8,505
*Farm and Ranch Management	7,232
Farm Equipment Mechanics (I & II)	7,258
Feed Industry Technology	7,612
Feedlot Management	9,975
Food Management	9,413
Heavy Equipment	6,233
Machine Shop	7,290
Medical Lab Assistant	5,813
Nurse Associate Degree	5,130
Nursery Management and Landscape Planning	8,721
Nurses Assistant	2,534
Office Education	3,664
Ornamental Horticulture	8,721
Other Medical Lab Technicians	5,813
Photography	8,978

*Individuals that have vocational training.

Table 33 (continued)

Program Type	Kansas Average Annual Salary for 1970
Plastics	7,612
Police Science	7,281
Practical Nurse	3,726
Printing	7,533
*Production Agriculture (I & II)	7,232
Radio and TV Repair	7,077
Sheet Metal and Fabrication	6,918
Truck Driving	6,501
Welding	6,779

* Individuals that have vocational training.

^aU. S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, 1970 Census of Population, Detailed Characteristics: Kansas, Table 176, Occupation of the Female Experienced Civilian Labor Force by Earnings in 1969 and Race: 1970, (Washington: Government Printing Office, 1972), pp. 18-696 - 18-698.

STATISTICAL TOOLS

To evaluate the four hypotheses tested in this study, the simple analysis of variance with unequal samples technique as described by Roscoe³ was used.

The first step in this technique was to establish lists of programs by the variable to be examined (X) and the number of observations (N). In this case, the variables to be examined were payback periods or accrued long run benefits while the number of observations were the number of programs.

The next step was to calculate the mean squares for between and within groups. This was accomplished by first computing the degrees of freedom for both groups. The sums of squares (SS) were then calculated by the following formulas:

Sum of Squares for Between

$$SS_b = \sum_{j=1}^k \frac{T_j^2}{n_j} - \frac{T^2}{N}$$

Sum of Squares for Within

$$SS_w = \sum_{j=1}^k \sum_{i=1}^{n_j} x_{ij}^2 - \sum_{j=1}^k \frac{T_j^2}{n_j}$$

The final step used to calculate mean squares was to divide the sums of squares by the degrees of freedom for each group.

The hypotheses tested in this study were that there is no significant difference between the mean square between and the mean square within. This was achieved by forming an F-ratio using the following formula:

$$F = \frac{MS_b}{MS_w} \quad \text{With df} = k-1, N-K$$

Where:

MS_b = Mean Square Between

MS_w = Mean Square Within

k = Number of groups

N = Total number of entries

The computed F-ratio was then compared to a tabled F-distribution.⁴

The null hypothesis was retained if the calculated F-ratio was smaller than the tabled F-distribution at the .01 alpha level.

ANALYSIS PROCEDURES

The following procedures were used to calculate or otherwise determine critical variables in this study.

Length of Training

Length of training was established by determining whether a training program was a one year or a two year program. This figure might be more accurately described as the student effort needed to successfully graduate. These data were taken from the Office of Education Report, OE 3138, which is prepared annually by the Kansas State Department of Education and the VE 50 Report prepared by the individual schools annually which is the State's version of the OE 3138.

Cost of Training

Cost of training information was acquired from the 1972 Fiscal Year Budgets prepared by the area schools and reported to the Division of Vocational Education, State Department of Education. Cost of training was based on the total program budget divided by the number of successful graduates. Figures were computed for each individual program and each program type found in the area schools.

Foregone Productivity

Foregone productivity was calculated by multiplying time in training in years times the average Kansas annual salary for workers who have completed a high school degree.

Determination of Accrued Long Run Benefits

The accrued long run benefits for a particular program were determined using the following formula based on the model presented in this chapter.

$$LRB = (47 - A) \times B - C/D - [47 \times (E \times 6726 + F \times 2547)/(E + F)]$$

Where:

- A = Length of training program
- B = Average salary for workers in occupations in Kansas
- C = Cost of training program
- D = Number of students placed from training program
- E = Number of males in training program
- F = Number of females in training program

Payback Period

The payback period for a particular program was determined using the following formula based on the model presented in this chapter.

$$PBP = \frac{A \times B + C/D}{B - (E \times 6726 + F \times 2547)/(E + F)}$$

SUMMARY

The cost/benefit model provides an estimate of payback periods and accrued long run benefits. The payback periods were determined from the intersection of a line representing the accumulated productivity of a non-vocational graduate and a line representing the accumulated productivity of a vocational graduate on a time and dollar graph. The accrued long run benefits were determined by examining the difference between these lines when time equals forty-seven years after high school graduation. The population consisted of all full-time students in the fourteen Kansas area vocational technical schools. Data pertaining to the programs were gathered from the VE 50 and the VE 60 forms.

The simple analysis of variance with unequal samples technique was used to evaluate the four hypotheses. F-ratios were calculated and the null hypotheses was retained if the calculated F-ratios were smaller than the tabled F-distribution at the .01 level.

FOOTNOTES

¹U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, 1970 Census of Population, Detailed Characteristics: Kansas, Table 176, "Occupation of the Female Experienced Civilian Labor Force by Earnings in 1969 and Race: 1970", (Washington: Government Printing Office, 1972), pp. 18-696 - 18-698.

²U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, 1970 Census of Population, Detailed Characteristics: Kansas, Table 197, "Income in 1969 of Persons 18 Years Old and Over by Years of School Completed, Age, Race, and Sex: 1970", (Washington: Government Printing Office, 1972), p. 18-813.

³John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences, 1st ed., (Holt, Rinehart and Winston, Inc., 1969), pp. 230-237.

⁴Ibid., pp. 322-323.

Chapter 34

FINDINGS

INTRODUCTION

This chapter is concerned with presenting (1) data on payback periods and accrued long run benefits by individual program, and (2) the disposition of hypotheses one through four. A section on serendipitous findings is also included.

PAYBACK PERIODS AND ACCRUED LONG RUN BENEFITS BY PROGRAM

Using the formulas described in Chapter 33, payback periods and accrued long run benefits were calculated by individual program type in each AVTS. When a program never returns the initial investment in training, infinity was inserted for the payback period. Payback periods less than infinity but more than forty-seven years will also never return the investment because workers will (for the purpose of this study) not continue to be productive beyond age sixty-five. These payback periods were entered in Table 34. numerically so that a distinction can be made between this type of program and programs with an infinite payback period.

AVERAGE COST/BENEFITS BY PROGRAM TYPE

Payback periods and accrued long run benefits for particular program types were summed and divided by the number of programs in each program type to give an average. These averages are presented in Table 35.

There were forty-nine types of programs found in the fourteen area vocational and technical schools in Kansas.¹ Of these forty-nine program types, thirty-nine will pay back society's investment in the training during the work life of successful graduates. Three of the program types would pay

Table 34

Schools and Program by Payback Periods
and Accrued Long Run Benefits

School	Program	Payback Period	Accrued Benefit
1	Agricultural Chemical Technology	11.08	31,819.29
	Air Conditioning	7.29	50,023.59
	Auto Mechanics	∞	-28,533.11
	Bricklaying	8.22	48,007.00
	Carpentry and Cabinetmaking	∞	-23,957.19
	Diesel Mechanics	20.44	14,129.00
	Distributive Education	1.78	160,564.46
	Drafting	12.58	32,996.05
	Instrumentation Technology	18.79	24,993.34
	Machine Shop	16.57	17,160.17
	Nurses Assistant	∞	-4,168.33
	Office Education	3.97	48,054.05
	Welding	161.90	-6,090.00
2	Air Conditioning and Refrigeration	7.98	49,165.00
	Auto Body	∞	-29,058.87
	Auto Mechanics	∞	-45,407.00
	Aviation Mechanics	9.69	44,695.25
	Cabinetmaking and Millwork	∞	-15,242.00
	Carpentry	∞	-32,630.00

Table 34(continued)

School	Program	Payback Period	Accrued Benefit
	Child Care	139.18	-1,935.00
	Dental Assistant	7.66	26,078.13
	Dental Hygienist	2.56	94,336.37
	Drafting	20.80	14,722.06
	Electricity	10.17	45,587.34
	Foods	1.52	290,669.26
	Machine Shop	18.84	15,878.84
	Medical Lab Assistant	2.85	106,016.90
	Metal Fabrication	87.94	7,861.00
	Nursery and Lawn Care	4.39	90,242.00
	Plastics	13.14	29,994.80
	Practical Nurse	5.30	38,593.73
	Printing	7.48	53,911.14
	Welding	196.08	-7,901.50
3	Air Conditioning	7.03	50,360.44
	Auto Mechanics	∞	-27,576.80
	Data Processing	2.53	183,579.37
	Distributive Education	4.56	62,015.45
	Drafting	15.81	19,991.56
	Electricity	7.18	49,287.58
	Office Education	4.03	47,989.96
	Practical Nurse	5.37	38,844.96
	Printing	12.78	27,609.12

Table 34(continued)

School	Program	Payback Period	Accrued Benefit
4	Auto Mechanics	∞	-28,600.82
	Building Trades	∞	-26,824.26
	Distributive Education	1.78	160,562.10
	Electronics	5.77	73,336.86
	Feedlot Management	3.28	142,013.89
	Machine Tool	31.49	8,744.00
	Nurses Assistant	∞	-20,759.33
	Office Education	4.47	47,497.79
	Practical Nurse	3.76	50,974.67
	Printing	14.16	31,775.98
	Welding	176.28	-6,852.00
5	Airframe and Power Plant	11.54	42,472.00
	Auto Body	∞	-28,472.22
	Auto Mechanics	∞	-30,278.47
	Commercial Art	3.31	140,075.33
	Diesel Mechanics	16.70	16,114.80
	Distributive Education	2.25	158,884.55
	Drafting	9.89	34,951.56
	Electronics Communication	9.15	71,711.73
	Machine Shop	20.59	14,894.34
	Office Education	3.87	48,170.14
	Printing	6.21	61,313.50
	Refrigeration	7.34	49,967.39

Table 34(continued)

School	Program	Payback Period	Accrued Benefit
6	Welding	153.21	-5,629.47
	Auto Mechanics	∞	-28,803.12
	Carpentry	∞	-27,676.71
	Distributive Education	1.78	160,564.46
	Drafting	47.85	-398.00
	Electricity	17.74	36,222.00
	Electronics	15.47	56,082.00
	Machine Shop	19.40	15,561.70
	Nurses Assistant	∞	-7,201.68
	Office Education	3.97	48,054.06
	Ornamental Horticulture	5.19	83,405.29
	Police Science	12.95	21,629.62
	Practical Nursing	4.25	50,401.53
7	Printing	16.42	24,674.50
	Auto Mechanics	∞	-28,470.92
	Carpentry	∞	-28,657.14
	Drafting	12.58	26,722.44
	Electricity	9.49	46,430.34
	Electronics	6.91	71,316.34
	Foods	2.54	199,088.79
	Practical Nurse	5.56	36,911.78
	Printing	5.32	81,796.60
	Welding	244.74	-10,480.40

Table 34(continued)

School	Program	Payback Period	Accrued Benefit
8	Agricultural & Diesel Mechanic	32.96	7,466.00
	Auto Mechanics	∞	-45,578.00
	Child Care	172.84	-2,642.75
	Cosmetology	9.06	14,112.31
	Distributive Education	1.87	154,274.59
	Farm and Ranch Management	15.74	15,815.72
	Feed Industries Technology	32.96	7,466.00
	Foods	1.43	312,817.12
	Machine Shop	16.35	17,281.15
	Nurses Assistant	∞	-17,218.84
	Office Education	4.97	46,939.59
	Practical Nurse	3.80	50,925.05
	Radio and TV	23.57	8,220.75
	Truck Driving	∞	-11,732.77
	Welding	140.81	-4,972.27
9	Auto Body	∞	-28,176.31
	Auto Mechanics	∞	-28,221.11
	Civil Technology	8.62	40,412.30
	Drafting	9.16	34,914.99
	Electricity	7.26	49,196.19
	Machine Shop	18.14	16,275.00
	Nursery Management and Landscape Planning	2.96	141,958.17
	Photography	3.54	143,276.25

Table 34(continued)

School	Program	Payback Period	Accrued Benefit
10	Practical Nurse	6.73	29,283.73
	Printing	6.16	59,213.27
	Radio and TV	25.78	7,445.34
	Small Engine and Cycle and Marine Maintenance	15.71	16,646.19
	Welding	156.87	-5,823.52
	Auto Mechanics	∞	-29,584.00
	Drafting	10.49	34,321.01
	Farm and Ranch Management	16.81	15,275.95
	Foods	1.42	312,920.00
	Machine Shop	35.55	6,455.00
11	Medical Lab Assistant	2.92	105,172.68
	Nurses Assistant	456.00	-6,539.00
	Printing	17.22	28,640.66
	Auto Body	∞	-29,288.81
	Auto Mechanics	∞	-28,913.71
	Carpentry	∞	-28,002.87
	Communication Technology	9.61	33,127.39
	Cosmetology	9.81	13,832.85
	Drafting	17.47	19,152.13
	Electronics/Electricity	8.00	48,277.10
12	Farm and Ranch Management	15.68	15,846.37
	Appliance Repair	18.47	15,176.00
	Auto Body	∞	-30,222.57

Table 34 (continued)

School	Program	Payback Period	Accrued Benefit
13	Auto Mechanics	∞	-28,756.50
	Cosmetology	22.87	5,613.36
	Distributive Education	3.14	105,736.16
	Electronics	7.18	70,839.25
	Foods	3.51	199,088.79
	Nurse Assistant	∞	-4,000.11
	Nurse Associate Degree	2.14	112,065.15
	Practical Nurse	3.55	51,223.82
	Printing	11.22	49,493.30
	Radio and TV	29.02	6,307.50
	Welding	250.38	-10,779.66
	Agribusiness Technology	8.32	39,837.96
	Auto Mechanics	∞	-32,244.00
14	Carpentry	∞	-26,003.09
	Data Processing	2.24	228,076.14
	Drafting	21.85	18,750.20
	Electronics	6.71	71,674.67
	Machine Shop	15.96	17,501.34
	Office Education	5.63	46,200.72
	Police Science	11.95	23,824.40
14	Welding	139.35	-4,894.66
	Auto Mechanics	∞	-28,544.93
	Carpentry	∞	-27,170.60

Table 34(continued)

School	Program	Payback Period	Accrued Benefit
	Data Processing	2.84	218,836.70
	Diesel Mechanics	16.26	16,352.65
	Distributive Education	1.82	160,427.16
	Electricity	6.88	53,476.02
	Farm Equipment Mechanics	15.46	16,778.34
	Heavy Equipment	∞	-32,950.09
	Practical Nurse	6.16	32,630.56
	Production Agriculture	15.80	15,784.33
	Welding	32.84	3,438.65

Table 35

Program Types by Average Payback Periods
and Average Accrued Long Run Benefits

Rank	Program Type	Average Payback Period	Average Accrued Benefits
1	Food Management	2.08	26,916.40
2	Nurse Associate Degree	2.14	112,065.00
3	D.E. Cooperative	2.39	140,383.00
4	Business Data Processing	2.54	210,163.67
5	Dental Hygienist	2.56	94,336.00
6	Medical Lab Assistant	2.94	105,594.00
7	Feedlot Management	3.28	142,013.00
8	Commercial Art and Artist Paste-Up	3.31	140,075.00
9	Photography	3.54	143,276.00
10	Nursery Management and Landscape Planning	3.68	116,100.00
11	Office Education	4.36	47,621.29
12	Practical Nurse	4.94	42,198.22
13	Ornamental Horticulture	5.19	83,405.00
14	Air Conditioning and Refrigeration	7.41	49,878.75
15	Dental Assistant	7.66	26,078.00
16	Bricklaying	8.22	48,007.00
17	Agribusiness Technology	8.32	48,837.00

Table 35 (continued)

Rank	Program Type	Average Payback Period	Average Accrued Benefits
18	Electronics	8.40	66,566.75
19	Civil Technology	8.62	40,412.00
20	Communications Technology	9.61	33,127.39
21	Electricity	9.79	46,699.67
22	Food Industry Technology	10.04	32,745.00
23	Printing	10.77	46,491.56
24	Agricultural Chemical Technology	11.08	31,819.00
25	Air Frame and Power Plant	11.54	42,472.00
26	Police Science	12.45	22,726.50
27	Plastics	13.14	29,994.00
28	Cosmetology	13.21	11,185.67
29	Cycle and Small Engine Mechanic	15.71	16,646.00
30	Production Agriculture (I & II)	15.80	15,784.00
31	Farm and Ranch Management	16.08	15,645.33
32	Diesel Mechanic	17.80	15,531.67
33	Drafting	17.85	23,612.10
34	Appliance Repair	18.47	15,176.00
35	Machine Shop	20.18	15,125.63
36	Radio and TV Repair	22.00	13,774.75
37	Farm Equipment Mechanics (I & II)	24.21	12,122.00
38	Machine Tool	31.49	8,744.00

Table 35 (continued)

Rank	Program Type	Average Payback Period	Average Accrued Benefits
39	Agricultural Diesel Mechanics	32.96	7,466.00
40	Sheet Metal and Fabrication	87.94	7,861.00
41	Child Care	156.01	2,288.20
42	Welding	165.25	-5,998.20
43	Heavy Equipment	∞	-32,950.00
44	Auto Body Repair	∞	-29,043.20
45	Nurses Assistant	∞	9,980.83
46	Auto Mechanic	∞	-31,397.64
47	Carpentry	∞	-26,240.11
48	Truck Driving	∞	-11,732.00
49	Cabinetmaking and Millwork	∞	-15,242.00

back if the worker was productive for more than forty-seven years. Seven of the program types never could pay back society's investment.

Accrued long run benefits range from a positive \$210,163.67 to a negative \$32,950.00 per successful graduate. This wide range would seem to indicate that "type of program" was extremely significant in determining the potential productivity of successful graduates. This was further demonstrated in the disposition of the hypotheses.

DISPOSITION OF HYPOTHESIS 1

Hypothesis 1 which states "There is no significant difference between payback periods for the different program types in the fourteen area schools in Kansas" was rejected on the basis of an F-ratio of 234.4. This indicated that payback period was to some extent dependent upon program type. Table 36 depicts the summary of the simple analysis of variance data.

Table 36

Analysis of Variance for Payback Periods of Program Types

Source	df	SS	MS
Between Program Types	47	26,312,039	559,831
Within Program Types	119	284,127	2,388
TOTAL	166	26,595,166	XXXXXXX

$$F = \frac{MS_b}{MS_w} = \frac{559,831}{2,388} = F = 234.4$$

DISPOSITION OF HYPOTHESIS 2

Hypothesis 2 which states "There is no significant difference between the accrued long run benefits from the different vocational program types in

the fourteen area schools in Kansas" was rejected on the basis of an F-ratio of 37.2. This indicated that accrued long run benefit was to some extent dependent upon program type. Table 37 depicts the summary of the simple analysis of variance data.

Table 37

Analysis of Variance for Accrued Long-Run
Benefits of Program Types

Source	df	SS	MS
Between Program Types	47	679,171	14,450
Within Program Types	119	46,167	388
TOTAL	166	725,388	XXXXXX

$$F = \frac{MS_b}{MS_w} = \frac{14,450}{388} = F = 37.2$$

DISPOSITION OF HYPOTHESIS 3

Hypothesis 3 which states "There is no significant difference in the payback periods for vocational programs in the different area schools in Kansas" was retained on the basis of an F-ratio of .30. This indicated that payback period was not dependent upon the school in which a program is located. Table 38 depicts the summary of the simple analysis of variance.

Table 38

Analysis of Variance for Payback
Periods of Schools

Source	df	SS	MS
Between School	13	671,214	51,631
Within School	153	26,124,952	170,751
TOTAL	166	26,796,166	XXXXXXX

$$F = \frac{MS_b}{MS_w} = \frac{51,631}{170,751} = .30$$

DISPOSITION OF HYPOTHESIS 4

Hypothesis 4 which states "There is no significant difference in the accrued long run benefits for vocational programs in the different area schools in Kansas" was retained on the basis of an F-ratio of .26. This indicated that accrued long run benefits were not dependent upon the school in which a program is located. Table 39 depicts the summary of the simple analysis of variance data.

Table 39

Analysis of Variance for Accrued Long Run
Benefits of Schools

Source	df	SS	MS
Between School	13	16,045	1,234

Table 39 (continued)

Source	df	SS	MS
Within School	<u>153</u>	<u>709,293</u>	4,635
TOTAL	166	725,338	XXXXX

$$F = \frac{MS_b}{MS_w} = \frac{1,234}{4,635} = F = .26$$

SERENDIPITOUS FINDINGS

The training conducted in Kansas' fourteen area vocational and technical schools apparently has not returned the monetary investment society has made. This does not imply that certain programs are not a sound investment or that the total training mix could not be restructured to be a sound investment. It does imply that, with a pretraining expected annual productivity of \$5,885.00 and a post training expected annual productivity of \$6,012.00, the average successful trainee could not work long enough to reimburse society's original investment of \$7,418.00 (Program costs plus foregone productivity).

Several variables could be adjusted to decrease the payback time and thereby make the possible training mixes better investments. First, if emphasis were placed on programs where expected productivity was relatively high, payback periods should decrease sharply. Secondly, if placement rates were increased, cost per successful trainee would decrease. Finally, productivity would be increased if training programs could be shortened. As a corollary to this final point, training in secondary programs would be more likely to payback than training in post secondary programs due to loss of productivity time.

An additional finding was that females had a better placement rate than males. This points out a limitation of the procedure used to calculate cost/benefits. The use of percent of female enrollment instead of percent

of female placement produced a questionable pretraining expected annual productivity. This caused the cost/benefit factors of the total program mix to be biased in a negative direction.

A final observation was that only the foregone productivity of the successful graduate was considered in the model used. If the total foregone productivity of all enrollees had been taken into account, a better analysis might have been obtained. Possibly this factor counterbalanced the use of female enrollment data previously discussed.

SUMMARY

Accrued long run benefits and payback periods were to some extent dependent upon program type. The geographic location of the program type in terms of school appear to have had little effect on the accrued long run benefits and payback periods.

The cost/benefit study indicated that the training in the fourteen area vocational and technical schools in Kansas did not return society's original financial investment. Placement, instructional cost and length of training programs were major variables contributing to this finding.

Two weaknesses discovered in the formulas used to calculate the accrued long run benefits and payback periods were:

1. Male and female ratios should have been computed using placement rather than enrollment data.
2. Foregone productivity should have been calculated using both the non-completers and the successfully placed student population.

Chapter 35

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

The purpose of this chapter is to present a summary of the study. Also included are conclusions based on findings from chapter four and recommendations derived from these conclusions.

SUMMARY

The study attempted to answer the question, "Does the type and/or location of vocational programs influence the societal accrued long run benefits and societal payback periods?" The population consisted of all programs in the fourteen Kansas Area Vocational Technical Schools. This selection was made because there appeared to be a need for a cost/benefit analysis of the area school programs.

The hypotheses tested were:

1. There is no significant difference between payback periods for the different program types in the fourteen area schools in Kansas.

Hypothesis 1 was rejected on the basis of an F-ratio of 23.4.

2. There is no significant difference between the accrued long run benefits from the different vocational program types in the fourteen area schools in Kansas. Hypothesis 2 was rejected on the basis of an F-ratio of 37.2.

3. There is no significant difference in the payback periods for vocational programs in the different area schools in Kansas. Hypothesis 3 was retained on the basis of an F-ratio of .30.

4. There is no significant difference in the accrued long run benefits for vocational programs in the different area schools in Kansas. Hypothesis 4 was retained on the basis of an F-ratio of .26.

Past studies indicated that program budgeting should be based on a cost/benefit analysis. These past studies concluded that vocational and technical education could be justified on the basis of a reduction in unemployment and higher wages for the program graduates. The reporting forms used to gather the data in this study were collected from each of the five Kansas state program administrators. These forms were:

1. VE 50 which was used to gather enrollment data;
2. VE 60 which was used to report follow-up data.

To evaluate the four hypotheses tested, the simple analysis of variance with unequal samples technique was used. F-ratios were computed and the null hypotheses was retained if the calculated F-ratio was smaller than the tabled F-distribution at the .01 alpha level.

The cost/benefit study indicated that accrued long run benefits and payback periods were dependent upon program types and not upon geographic location. The study also indicated that vocational and technical education in Kansas area schools has not returned society's original investment. Major factors contributing to this finding were placement, instructional cost, and length of programs.

CONCLUSIONS

The following conclusions were based on the findings of the study.

1. Program types in the fourteen area vocational and technical schools significantly influence potential benefits for society.
2. The geographic location of vocational and technical programs in Kansas does not significantly influence potential benefits for society.
3. As presently structured in the Kansas area vocational and technical schools, the total vocational education program mix does not appear to be an economically sound societal investment.
4. A restructuring of the existing vocational program mix could result in making vocational and technical training an economically sound investment for society.
5. The majority of program types offered in Kansas area vocational technical schools are an economically sound investment for society.
6. A major factor influencing non-payback programs in the Kansas area vocational technical schools is low placement rates.

7. The longer the student is involved in a program, the fewer number of years he has to repay society's original investment.
8. The model used in this study is a reasonably acceptable technique for computing cost/benefits of vocational and technical education.
9. The model used in this study could be improved if actual male and female placement data were used instead of male and female enrollment data.
10. The model used in this study could be improved if total foregone productivity was calculated using all student school time instead of only successful graduate school time.

RECOMMENDATIONS.

The following recommendations are based on the findings and conclusions of the study.

1. It is recommended that Kansas Vocational and Technical Education Administrators consider potential cost/benefit criteria when planning the vocational and technical program mix.
2. It is recommended that, when considering cost/benefit in planning the Kansas vocational and technical program mix, Kansas administrators need not consider geographic location.
3. It is recommended that the vocational and technical program mix in the Kansas area schools be restructured to make the training program mix an economically sound societal investment.
4. It is recommended that the fourteen Kansas area schools increase their placement rates, which will decrease educational cost per pupil.
5. It is recommended that the Kansas vocational and technical program training periods be shortened in order to reduce instructional cost and lengthen time available for employment.
6. It is recommended that improvements in the calculation techniques be made to include male and female placement data and total foregone productivity when conducting a cost/benefit analysis.
7. It is recommended that future cost/benefit studies be conducted, utilizing the model formulated in this study, to assess payback period and accrued long run benefits for vocational programs in Kansas and other states.

Part 8

THE DEVELOPMENT OF A DECISION MODEL FOR
VOCATIONAL-TECHNICAL EDUCATION PLANNING

Dale Edward Brooks

Chapter 36

INTRODUCTION

The historical bench mark for vocational and technical education occurred with the passage of the Smith-Hughes Act in 1917. This Act set the precedent and established a philosophy for vocational education that was to remain virtually unchanged until the Vocational Education Act of 1963. The idea that vocational education should be centered upon skill development for specific occupations proved to be so successful that it was written into legislation which followed the Smith-Hughes Act. Table 40 identifies related legislation and briefly describes highlights.¹

The concept of skill development for specific occupations gained impetus when the U.S. Department of Education organized occupational service areas for administration of the vocational education legislation. The states followed with a similar organizational structure which still exists in most instances. This structure is comprised of occupational service areas in: Agriculture, Distributive Education, Health Occupation Education, Home Economics, Office Occupations, Technical Education, and Trade and Industrial Occupations.

Local educational agencies that administer vocational education were also structured under the same organizational pattern. Thus, the functional and organizational structure of vocational education was the same from the local to the national level. Separate administrative offices were formed to serve the various occupational areas with the objective of providing education for specific skill development leading directly to employment or improvement of occupational skills.²

The emphasis of the early legislation caused the vocational education pattern that developed to be process centered. Several examples of the vocational education process that developed during this time were: simulation shops and laboratories, the cooperative method, and the project method. Evaluation centered upon individual head count of persons involved in the process. Planning centered upon methods and techniques of improving the process to better serve the occupational objectives.

Table 40

Summary of Vocational and Technical Education Legislation

Year	Legislative Title	Highlights
1917	Smith-Hughes Act	First act providing federal aid for vocational education.
1929	George-Reed Act	Promoted further development of agriculture, home economics, and trades and industry.
1934	George-Elizy Act	This was an extension of the George-Reed Act.
1936	George-Deen Act	Included federal support to a new vocational field designated as distributive education.
1940	Defense Training Act	Provided for education related to national defense industries.
1946	George-Barden Act	Amended and superseded the George-Deen Act and legalized the use of funds for occupational information and guidance.
1956	Health Amendments Act	Authorized appropriations for practical nursing training.
1958	National Defense Education Act	Authorized appropriations for programs designed to meet the national defense needs for highly skilled technicians.
1961	Area Redevelopment Act	Provided funds for the training and retraining of unemployed workers living in designated redevelopment areas.

Table 40 (continued)

Year	Legislative Title	Highlights
1962	Manpower Development and Training Act	Provided funds for training and retraining individuals unemployed or underemployed.
1963	Vocational Education Act	Focused national attention on vocational education. Focused on groups of people rather than categorical vocational education fields.
1968	Vocational Education Amendment	Vastly broadened the scope of vocational education.

The passage of the Vocational Education Act of 1963³ provided a new bench mark for vocational technical education. This Act broadened the emphasis of vocational education from occupational skill development to student needs and community employment needs. The effect of this shift in emphasis was to remove artificial barriers which had developed through the use of occupational categories and hence, to increase flexibility in student programming. The intent of the new Act was to provide services to people without respect to predetermined occupational groupings. Under the 1963 law, occupations designated as professional occupations (usually those requiring a baccalaureate degree) were not to be included among the occupations for which training was provided. With this exception, the Act suggested that if a training need existed, funds would be made available to take care of the need.

The Vocational Education Act of 1963 designated six purposes for which Federal funds could be used. They were: (1) vocational education for persons attending high school; (2) vocational education for persons who have completed or left high school and who are available for full-time study in preparation for entering the labor market; (3) vocational education for persons who have already entered the labor market and who need training or retraining to achieve stability or advancement in employment; (4) vocational education for persons who have academic, socio-economic, or other handicaps that prevent them from succeeding in the regular vocational education program; (5) construction of area vocational education school facilities; and (6) auxiliary services and activities to assure quality in all vocational education programs, such as teacher training and supervision, program evaluation, special demonstration and experimental programs, development of institutional materials, and state administration and leadership including periodic evaluation of state and local vocational education programs and services in light of information regarding projected manpower needs and job opportunities.⁴

A further indication of the broadening concept that the 1963 Act decreed is shown in the Federal Rules and Regulations for Administration of Vocational Education Programs:

The State Plan is a description of the State's vocational education programs. It shall set forth the State's authority under State law for its administration of such programs. It shall include the policies to be followed by the State in maintaining, extending, and improving existing programs and developing new programs of vocational education

so that persons of all ages in all communities of the State will have ready access to vocational training or retraining which is of high quality, with offerings that have been developed in light of actual or anticipated opportunities for employment, and which is suited to the needs, interests, and ability of such persons to benefit from such training.⁵

The rules and regulations further indicate that local education agencies participating in the administration of vocational education under the state authority must also develop an administrative plan. Local organizations will be evaluated by the State Board of Education to determine if the state and local plans effectively fulfill the purposes of the Vocational Act of 1963.⁶

The legislation has been interpreted by many local, state and federal officials to mean that the state plan for vocational education must be built upon local plans. The local plans must give a detailed account of just how that local education agency plans to use state and federal funds to maintain, extend, and improve existing programs and develop new programs of vocational education.

The vocational Education Amendments of 1968 broadened the scope of vocational education legislation. The Amendments covered programs for the disadvantaged, handicapped, adults, and all others who express a need for vocational education. The Act allowed funds to be used in preparation for employment, for instruction necessary to prepare individual students for successful completion of a vocational program, or for instruction that assists individuals in making an informed and meaningful occupational choice. The Amendments also emphasized that developers of State Plans must give due consideration to the results of periodic evaluations of state and local vocational education programs, services, and activities in the light of information regarding current and projected manpower needs and job opportunities.⁷

The 1963 Act further states that all applications from local educational agencies for funds must include assurances of adequate planning to meet the vocational education needs of potential students in the area or community served by such an agency. The applications also must include a plan related to the appropriate comprehensive area manpower plan for meeting the vocational education needs in the area or community served by such an agency.⁸

Several states are developing decision manpower planning models for state-wide evaluations. The state models are, in many instances, inappropriate in evaluating local districts or areas of service and do not readily lend

themselves to local administrative planning techniques. In fact, many local organizations do not have effective planning strategies which are required by Federal and State legislation and policy.⁹

PURPOSE

The purpose of this study is to develop a systematic procedure which can be used by administrators to devise local and state plans for vocational and technical education. The procedure should allow the planner to incorporate area characteristics which are inherent in the decision-making process. Variables which must be examined in the procedure include: (1) the local student population, (2) available financial resources, (3) projected employment opportunities, (4) the costs of various types of training, (5) the expected success of program graduates in getting employment, (6) the dropout rates for various programs, and (7) the occupational interests of students.

ASSUMPTION

This study will be based on the following assumptions.

1. Present economic, social, and technological factors will continue to the extent that planning for the future may be based on past history.
2. A model that is suitable for planning in Reno, Harvey, and McPherson counties will be applicable (with limited modifications) to other local areas in Kansas and the state as a whole.
3. The variables used in this model constitute the "set of variables" which extend the strongest effect upon vocational and technical education program planning.
4. The data provided by the State Department of Education is accurate for the state as a whole and for Reno, Harvey, and McPherson counties.

LIMITATIONS

This study will be subject to the following limitations.

1. Only the employment demands that are sub-professional in nature and are normally considered to be within the scope of vocational technical education will be considered.

2. The vocational-technical programs making up the curriculum of the Central Kansas Area Vocational School (CKAVTS), will be used as examples in the model testing procedures for the smaller area.

3. Only data available from the State Department of Education on CKAVTS that is commonly available on a continuing basis will be used to test the model.

4. A program mix of 50 vocational and technical education programs will be used in the model design.

SUMMARY

The concept behind legislation supporting vocational and technical education has evolved from a skill development for specific occupations orientation to a more complex student and community employment needs orientation. The more complex orientation requires sophisticated planning at the federal, state, and local levels. The federal and state planning procedure is established by policy as exemplified by the state plans which have been produced over the past four years. At the local level, however, there has been little, if any, progress made toward the development of an efficient strategy for planning vocational and technical education.

The purpose of this study is to develop a planning model to be used by education planners and administrators in Kansas. The system will be flexible, allowing for variations in the characteristics of communities and will provide alternative strategies for meeting community needs.

FOOTNOTES

¹M. G. Mudzo. "The Development of a Decision Model for Statewide Manpower Planning Related to Vocational Technical Education." (unpublished Doctor's dissertation, Oklahoma State University, 1970).

²Vocational Technical Terminology, (Washington: American Vocational Association, 1970), p. 3.

³U.S., Vocational Education Act of 1963, 88th Congress, 1st Session, Public Law 82-210.

⁴Ibid.

⁵U.S., Department of Health, Education and Welfare, Administration of Vocational Education, Vocational Education Bulletin No. 1 (Washington: Government Printing Office, 1967).

⁶Ibid.

⁷U.S., Congress, House of Representatives, Vocational Education Amendments of 1968, Public Law 90-576, 90th Congress, H.R. 18366 (Washington: Government Printing Office, 1969).

⁸Ibid.

⁹Statement by Dr. James L. Harris, Department of Adult and Occupational Education, Kansas State University, personal interview, November, 1972.

Chapter 37

DEFINITION OF TERMS--REVIEW OF RELATED LITERATURE AND DISCUSSION OF MAJOR CONCEPTS

The definitions listed are to assist the reader with a precise understanding of the terms and concepts applicable to this study.

DEFINITIONS

Accounting and Computing

Organized subject matter and learning activities which are designed to provide opportunities for pupils to develop knowledge, understanding, and skills concerned with the principles and theory of accounting practices.¹

Advertising

Organized subject matter and learning experiences related to planning, development by distributive employees, and management personnel in demand creation, and sales promotion activities utilizing displays, merchandising aids, and mass media in such enterprises as advertising agencies, display houses, retail and wholesale establishments, and production industries.²

Agri-business Technology

Planned learning activities which are concerned with farm resource analysis, accounting, production, financing resource acquisition, purchasing, farm inputs, performance records, contracts, farm marketing, and maintenance. The results of these learning activities are applied to formulating decisions involved in managing a farm or ranch operation.³

Agricultural Mechanics

A combination of subject matter and activities designed to develop abilities necessary for assisting with and/or performing the common and important operations or processes involved in the selection, operation, maintenance, and use of agricultural power, agricultural machinery and equipment, structures and utilities, soil and water management, and agricultural mechanics shop, including kindred sales and services.⁴

Agriculture Production

Subject matter and learning activities which are concerned with the principles and processes involved in the planning related and the economic use of facilities, land, water, machinery, chemicals, finance and labor in the production of plant and animal products.⁵

Agriculture Sales and Services

Subject matter and learning experiences concerned with preparing pupils for occupations involved in providing consumable supplies used in the production phase of agriculture--including processing, marketing, consulting, and other services.⁶

Agriculture Resources

A combination of subject matter and planned learning experiences concerned with the principles and processes involved in the conservation and/or improvement of natural resources such as air, forests, soil, water, fish, plants, and wildlife for economic and recreation purposes.⁷

Air Conditioning

Classroom and shop experiences which enable the student to become proficient in the installation, repair, and maintenance of commercial, industrial, and domestic air conditioning systems. Included is instruction in the theory and application of basic principles involved in conditioning of air; cooling, heating, filtering, and controlling humidity; the operating characteristics of various units and parts; blueprint reading; the use of technical reference manuals; the diagnosis of malfunctions; etc.⁸

Appliance Repair

Classroom and shop experiences concerned with the theory of electrical circuitry, simple gearing, linkages, and lubrication in the operation, maintenance, and repair of components including relays, time switches, pumps, and agitators used in appliances such as washers, dryers, vacuum cleaners, toasters, waterheaters, and stoves.⁹

Area Vocational School

A school or program involving a large geographical territory usually including more than one local basic administrative unit. It offers specialized

training to high school students who are preparing to enter the labor market. It also provides vocational or technical education to persons who have completed or left high school and are available for full-time study. These schools are sponsored by local communities or by the state.¹⁰

Auto Body

Specialized learning experiences concerned with all phases of repairing damaged bodies and fenders including metal straightening by hammering, smoothing areas by filing, grinding or sanding, concealment of imperfections, painting, and replacement of body components, including trim.¹¹

Auto Mechanics

Learning experiences concerned with the components of the vehicle including engine, power transmission, steering, brakes, and electrical systems. Included is training in the use of diagnostic and testing equipment and tools used in the repair process.¹²

Aviation Occupations

Classroom and practical experiences which include instruction relating to aircraft maintenance, aircraft operation, and ground support.¹³

Business Machine Repair/ Maintenance

Classroom and shop experiences concerned with maintaining and repairing a variety of office machines such as typewriters, dictation machines, calculators, data processing equipment used for recording and processing data, and duplicating and mailing machines.¹⁴

Carpentry

Classroom and shop experiences involving layout, fabrication, assembly, installation, and repair of structural units. Emphasized in instruction are the care and use of hand and power tools; equipment and materials; common systems of frame construction and the principles involved; and drafting, blueprint reading, applied mathematics, and materials estimating.¹⁵

Child Care and Guidance

Preparation for various kinds of employment related to child care centers and young children, e.g., assisting directors of child daycare centers

or nursery schools, assisting with activities on playgrounds and in recreation centers, and caring for children in homes and in such public places as stores, playgrounds, recreation centers, and transportation terminals.¹⁶

Civil Technology

A planned program of classroom and laboratory experiences including the study of physical sciences, mathematics, surveying, strength of materials, and other specialty courses leading to preparation for designing, testing, and supervising the construction of highways, railroads, airports, bridges, harbors, irrigation works, sanitary plants, and other structures. The graduate works in direct support of the civil engineer.¹⁷

Clothing Management, Production, and Services

Preparation for employment concerned with clothing and textiles, e.g., fitting and altering ready-made garments, custom tailoring and dressmaking, laundry--drycleaning work, demonstration work, and technical work in business and industry.¹⁸

Commercial Art

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to the design and execution of layouts and making illustrations for advertising, display, and instructional manuals. Instruction includes advertising theory and preparation of copy, lettering, poster design, fashion illustration, silk screen, air brush and touchup, inks and color dynamics, package and product design, drawings for line and halftone reproduction, and other display devices and exhibits. Instruction leads to preparation for various types of employment such as fashion illustrator, technical illustrator, interior decorator, and advertising artist.¹⁹

Cosmetology

Classroom and practical experiences concerned with a variety of beauty treatments, including the care and beautification of the hair, complexion, and hands. Instruction includes training in giving shampoos, rinses, and scalp treatments; hair styling, setting, cutting, dyeing, tinting, and bleaching; permanent waving; facials; manicuring and hand and arm massaging. Bacteriology,

anatomy, hygiene, sanitation, salon management, and customer relations are also emphasized. Instruction is designed to qualify for the licensing examination.²⁰

Diesel Mechanic

Classroom and shop experiences which are concerned with all phases of repair work on diesel engines used to power buses, ships, trucks, railroad trains, electric generators, construction machinery, and similar equipment. Instruction and practice are provided in the diagnosis of malfunction; disassembly of engines and examination of parts; reconditioning and replacement of parts; repair and adjustment of fuel injection systems, oil and water pumps, generators, governors, auxiliary and accompanying power units, controls, and transmissions. The use of technical manuals, a variety of hand and power tools, and testing and diagnostic equipment are also studied.²¹

Distributive Education

Distributive education includes various combinations of subject matter and learning experiences related to the performance of activities that direct the flow of goods and services, including their appropriate utilization, from the producer to the consumer or user. These activities include selling, and such sales-supporting functions as buying, transporting, storing, promoting, financing, marketing, research, and management.²²

Drafting

Organized specialized learning experiences which emphasize theory, use of the drafting room, and laboratory and shopwork as each relates to gathering and translating data or specifications, including the aspects of planning, preparing, and interpreting mechanical, architectural, structural, pneumatic, marine, electrical/electronic, typographical, and other drawings and sketches. Instruction is designed to provide experiences in drawing; in the use of reproduction materials, equipment, and processes; the preparation of reports and data sheets for writing specifications; the development of plan and process charts and drawings; and the development of models.²³

Drivers and Deliverymen Cluster (Transportation)

Organized subject matter and learning experiences related to the physical

movement of people, personal effects and products, and the sales, storing, and sales-supporting tasks performed by distributive employees and management personnel in enterprises engaged in passenger and freight transportation, public warehousing, and services incidental to transportation.²⁴

Electricity

Classroom and shop experiences concerned with the layout, assembly, installation, testing, and maintenance of electrical fixtures, apparatus, and wiring used in electrical systems. Instruction is provided in the reading, interpretation, and understanding of residential, commercial, and industrial wiring based on controlling electrical codes.²⁵

Electronics (Vocational)

Organized specialized learning experiences which include theory, laboratory, and shopwork as each relates to planning, producing, testing, assembling, and installing and maintaining electronic communications equipment such as radio, radar, and television, industrial electronic equipment, including digital computers; new electronic systems, components, and equipment; and control devices.²⁶

Electronics (Technical)

Subject matter and laboratory experiences organized to provide preparation in the speciality courses, physical science, mathematics, and general education concerned with the design, development, modification, and testing of electronic circuits, devices and systems. Subject matter incorporates solid state and microminiaturization devices and representative systems such as microwave systems, computers, and controls.

The program is designed to develop, in the individual, the capacity to perform in such areas as: practical circuit feasibility; prototype development and testing; development of maintenance techniques; systems analysis including design, selection, installation, calibration, and testing; and the application of engineering data and preparation of reports and test results in support of the professional personnel in the electronics field.²⁷

Expected Costs Per Program

An average annual cost of financing a vocational technical education program.

Expected Enrollment
Per Program

The full-time equivalent enrollment in the program computed as:

$$\text{FTE} = \frac{(\text{Student count}) (\text{Total yearly hours of attendance})}{1080}$$

The 1080 is equal of one student attending 180, 6-hour days.

Expected Placement
Per Program

The number of students expected to enter employment in the field of training or a related field, directly from the training program.

Food Service Cluster
(Quantity Food Occupations)

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to planning, selecting, purchasing, preserving, preparing, and serving food and food products. Included is the study of a variety of foods and their nutritional values, food processing, quantity cooking, storing equipment, and sanitation in food handling and management.

Instruction emphasizes quantity food service occupations in commercial food service establishments such as restaurants, cafeterias, drive-ins, tearooms, bakeries, and meat, fish, and poultry markets, in other retail food shops which are operated independently or are located in enterprises such as hotels, travel terminals, industrial plants, hospitals, or clubhouses; and in special food services as those associated with airline catering or with takeout food establishments.²⁸

Graphic Arts

Organized specialized learning experiences which include theory, laboratory, and shopwork as they relate to all phases of hot and cold typesetting, layout, composition, presswork, and binding, including flexography, lithography, photoengraving, and other graphic arts related to the printing industry. Emphasis is on typeographical layouts and design, hand and machine typesetting, camera and plate work, imposition, typesetting, offset and platen press makeup and operation, papercutting, ink and color preparation, binding, and production

by silkscreen process. Instruction leads to preparation for various types of employment such as typesetter, compositor, cameraman, platemaker, cost analyst, expeditor, and production planner.²⁹

Health Occupations Education

Education for health occupations comprises the body of related subject matter, or the body of related courses, and planned experiences designed to impart knowledge and develop understanding and skills required to support the health professions. Instruction is organized to prepare pupils for occupational objectives concerned with assisting qualified personnel in providing diagnostic, therapeutic, preventive, restorative, and rehabilitative services to people, including understanding and skills essential to provide care and health services to patients.³⁰

Heavy Equipment (Construction)

Classroom and practical work experiences concerned with the operation, maintenance, and repair of heavy-duty equipment such as bulldozers, cranes, graders, tractors, concrete mixers, crawler-mounted shovels, trailer-mounted compressors, and the gasoline or diesel engines powering the equipment.³¹

Home Economics

Home economics comprises the group of related courses or units of instruction organized for purposes of enabling pupils to acquire knowledge and develop understanding, attitudes, and skills relevant to personal, home, and family life, and occupational preparation using the knowledge and skills of home economics.³²

Instructional Program

A single teacher vocational-technical instructional unit.

Kansas Utilization Study Project

A research project conducted by Kansas State University under contract to the Kansas State Board of Education, Division of Vocational Education. The purposes of the project are to provide data on projected manpower supply and demand, and interface the data in such a way as to estimate future discrepancies between these two factors. In addition, the project will provide data on the

need for upgrading training, data on student interest relative to various occupational clusters, and data on potential student population across the state of Kansas.³³

Linear Programming

A mathematical process which concerns itself with problems related to the efficient use of allocation of limited resources to meet desired objectives. These problems are characterized by the large number of solutions that satisfy the basic conditions of each problem. The selection of a particular solution as the best solution to a problem depends on some aim or over-all objective implied in the statement of the problem. A solution that satisfies both the conditions of the problem and the given objective is termed an optimum solution. The complete mathematical statement of a linear-programming problem includes a set of simultaneous linear equations which represent the conditions of the problem and a linear function which expresses the objective of the problem.³⁴

Maximized Equation

A linear programming mathematical technique of maximizing a linear combination of expressed variables.

Office Occupations

A body of subject matter, or combinations of courses and practical experience, is organized into programs of instruction to provide opportunities for pupils to prepare for and achieve career objectives in selected office occupations. In the instructional process, various aspects of subject matter frequently are drawn from other subject-matter areas. Learning experiences are designed to lead to employment and/or advancement of individuals in occupations in public or private enterprises or organizations related to the facilitating function of the office.³⁵

Optimum Program Mix

A listing of vocational technical education instructional programs that have been elected after the application of criteria that allows the program selection to be based upon employment opportunity, student interest and other variables that directly effect the various aspects of education.

Painting

Specialized classroom and shop experiences with the preparation and finishing of exterior and interior surfaces by the application of protective or decorative coating materials such as lacquer, paint, and wallpaper. Instruction includes experiences in scraping, burning, or sanding surfaces, making, mixing, and matching paints and colors; and applying coating with brush, roller, or spray gun, or by cutting, pasting, and hanging wallpaper.³⁶

Photography

Organized specialized learning experiences which include theory, laboratory, and studio work as each relates to all phases of camera uses and photographic processing. Instruction includes composition and color dynamics, contact printing, and enlarging; developing film; air brush and retouching, coloring, and copying; utilization of cameras, meters, and other photographic equipment; portrait, commercial, and industrial photography; and processes such as microfilming and preparing copy for other printing and graphic arts processing.³⁷

Plumbing

Specialized classroom and shop experiences concerned with layout assembly, installing, altering, and repairing piping, including related fixtures and fittings in structures, by the use of pipecutting, bending, and threading tools, welding, soldering, and brazing equipment; and other hand and power tools and equipment.³⁸

Printing Craftsmen Cluster

See Graphic Arts Occupations.

Protection Service Cluster

Planned learning experiences concerned with training for the performance of occupations in Local, State, and Federal government agencies. These occupations usually are concerned with specialized activities limited to local, county, state, and federal government, and do not occur elsewhere in the economy. Typical activities include police, fire protection, emergency, and rescue squad work, safety, sanitation, transportation, and school bus driving.³⁹

Program Student Capacity

The number of students that a program can serve is determined by policy of the State Department of Education of Kansas. This data is also presented in Tables 41 and 42, pages 497-502.

Program Placement Rates

For test number one, the number of students expected to be placed in the work force has been taken from the fiscal year 1971-1972 annual program plan for the Central Kansas Area Vocational Technical School. This data is presented in Table 41, pages 497-499.

For test number two, the number of students expected to be placed by program type in the work force was taken from State averages presented by the State Department of Education. The data is depicted in Table 3, pages

Manpower Needs

The data for manpower needs have been taken from the Handbook for Vocational and Technical Education, Planners, Cycle II.² The raw data are presented in Table 44. These data are used to calculate the number of programs needed to meet manpower demand.

Number of Students to be Served

These data reflect the expected number of students to be served. For test one, this figure was 1,080 while for test two, the figure was 42,665. Data have been taken from the Kansas State Plan and the Central Kansas Area Plan.

Number of Males and Females to be Served

These data reflect the percent of males and females to be served. The labor force in Kansas is approximately forty percent female and sixty percent male. These percentages were used to project the number of students to be served by sex.

Radio and TV Mechanics

Specialized theory and practice which are concerned with the construction, maintenance, and repair of radios and television sets. Training also prepares pupils to diagnose troubles and make repairs on other electronic products such as high-fidelity sound equipment, phonographs, and tape recorders.⁴⁰

Sheet Metal Mechanics

Specialized classroom and shop experiences concerned with the layout, fabrication, erection, or installation, and maintenance of items made of steel, copper, stainless steel, and aluminum such as ventilating, air conditioning and heating ducts, kitchen equipment, signs, furniture, and skylights. Instruction emphasizes the use of handtools and machines such as the cornice brake, forming rolls, and squaring shears; drafting; and blueprint reading.⁴¹

Slack Variables

Variables that have been created to complete linear programming equations.

Technical Education

Technical education is concerned with that body of knowledge organized in a planned sequence of classroom and laboratory experiences, usually at the postsecondary level, to prepare pupils for a cluster of job opportunities in a specialized field of technology. The program of instruction normally includes the study of the underlying sciences and supporting mathematics inherent in technology, as well as methods, skills, materials, and processes commonly used and services performed in the technology. A planned sequence of study and extensive knowledge in a field of specialization is required in technical education including competency in the basic communication skills and related general education. Technical education prepares for the occupational area between the skilled craftsman and the professional person such as the physician, the engineer, and the scientist.⁴²

Textile Occupations Cluster

Classroom and shop experiences concerned with all aspects of the fabrication of textiles and kindred materials. Instruction emphasizes the fabrication and repair of garments constructed of cotton, wool, synthetic

fibers, or fur; apparel accessories, e.g., handbags, belts, shawls, and gloves; white goods such as sheets and pillowcases and furnishings, such as slipcovers, drapes, and curtains.⁴³

Trade and Industrial Occupations

Trade and industrial occupations is the branch of vocational education which is concerned with preparing persons for initial employment, or for upgrading or retraining workers in a wide range of trade and industrial occupations. Such occupations are skilled or semiskilled and are concerned with layout designing, producing, processing, assembling, testing, maintaining, serving, or repairing any product or commodity. Instruction is provided (1) in basic manipulative skills, safety judgment, and related occupational information in mathematics, drafting, and science required to perform successfully in the occupation, and (2) through a combination of shop or laboratory experiences simulating those found in industry and classroom learning. Included is instruction for apprentices in apprenticeship occupations or for journeymen already engaged in a trade or industrial occupation. Also included is training for service and certain semiprofessional occupations considered to be trade and industrial in nature.⁴⁴

Transportation and Public Utilities Cluster

Organized subject matter and learning experiences related to the physical movement of people, personal effects and products, and the sales, storing, and sales-supporting tasks performed by distributive employees and management personnel in enterprises engaged in passenger and freight transportation, public warehousing, and services incidental to transportation.⁴⁵

Upholstering

Classroom and shop experiences concerned with all aspects of upholstery, including furniture, automobile seats, caskets, mattresses, and bedsprings. Instruction includes history and styles of furniture; installing, repairing, arranging, and securing springs, filler, padding, and covering material; patternmaking; cutting, sewing and trimming outside coverings; cushion filling; styling and designing; tufting and buttoning and wood refinishing.⁴⁶

Vocational Education

Vocational or technical training or retraining which is given in schools or classes (including field or laboratory work and remedial or related academic and technical instruction incident thereto) under public supervision and control or under contract with a state board or local educational agency, and is conducted as part of a program designed to prepare individuals for gainful employment as semiskilled or skilled workers or technicians or sub-professionals in recognized occupations and in new and emerging occupations, or to prepare individuals for enrollment in advanced technical education programs, but excluding any program to prepare individuals for employment in occupations generally considered professional or which require a baccalaureate or higher degree.⁴⁷

Welding

Specialized classroom and shop experiences concerned with all types of metal welding, brazing, and flame cutting. Instruction emphasizes properties of metals, blueprint reading, electrical principles, welding symbols, and mechanical drawing.⁴⁸

REVIEW OF RELATED LITERATURE

Major shifts have occurred in the labor market in recent years and these shifts have had limited impact on the vocational education planning programs.

Gerald Somers⁴⁹ contends that Vocational Education has not been as responsive as it should have been to changes in a dynamic labor market. The major labor market changes reported by Somers were:

1. A marked shift from employment in agriculture and other primary industries to the so-called tertiary industrial sector-service industries and governments.
2. A revolutionary increase in the labor force participation of women, especially married women.
3. A marked occupational shift from manual unskilled work to white-collar, professional and technical skills.
4. A continuing shortage of highly skilled craftsmen.

5. A growing recognition of the mobility of workers, between geographic areas, between industries and between occupations.

6. An increasing concern with the labor market position of the disadvantaged and the unemployed.⁵⁰

While discussing changes that have affected the vocational-technical educational system of Oklahoma, Maurice Roney and Paul Braden,⁵¹ add the following three factors to Somer's list:

1. The revolutionary discoveries in science and technology.

2. More trained manpower is needed at a faster rate than can be supplied by the public and private institutions.

3. Changes in industry, business, and agriculture require highly trained workers in addition to the retraining of those whose skills have become obsolete.

Roney and Braden also maintain that only through the development of educational institutions keyed to the occupational needs of a dynamic labor force can the efficient development of human resources take place. Any other alternative will result in a body of unemployed and underemployed workers, too poorly trained to make a contribution to a sophisticated technological economy.⁵²

Jerome Moss Jr.,⁵³ reporting a recent study concerning procedures and methods used by vocational administrators, was highly critical of the lack of systematic, quantitative procedures used in arriving at decisions. Moss's justification for the study was based upon the validity of the three following assumptions:

1. Program evaluation is essential to systematic improvement in educational efficiency and effectiveness.

2. An intensification of evaluation is highly desirable.

3. Much of what has been done to date in the name of program evaluation is of questionable usefulness.⁵⁴

Moss maintained that because of the lack of vocational education researchers, and the complexity of research techniques, very little has been done in vocational education evaluation since the passage of the Vocational Education Act of 1963.⁵⁵

Moss further maintained that:

Evaluation is essential to the development of a science of instruction without which we shall continue to operate by hunches, authority, traditional, and personal experiences. From now on, however, the picture must change. The advisory council on vocational education has demanded greater efforts at evaluation.⁵⁶

Social scientists from a wide variety of disciplines are turning their attention to the assessment of various systems of manpower training. Vocational education's social obligation of evaluation is being assumed by others, and the results could determine its very existence. Vocational education must evaluate its own programs using appropriate criteria and methodology so that decisions concerning the future can be based upon data which properly reflects educational perspectives.⁵⁷

Coster, Morgan, and Dane⁵⁸ have developed a model that exemplifies the national goal for occupational education. The national goal according to their statement is optimum employment for each individual capable of participating in the occupational structure of society. This goal should be developed through individual relationships to available school curricula, based upon student needs and employment opportunity.⁵⁹

The Coster, Morgan and Dane model, Figure 40, consists of two systems, the school system and the occupational structure of work system. The input to the model is the individual who brings with him his own social-familial value system. He progresses through or leaves the educational system to the labor force. Entry to the labor force is through a staging area. After obtaining employment he may test his employment for optimal satisfaction and he may change status through several alternatives.

The model illustrates that to function effectively, the school system must retain the individual until he leaves the system and enters employment with maximum benefit to himself and the highest possible degree of productivity for the social and economic structure of society.

The model illustrates three elements necessary to optimize employment. The elements are structured across both the educational system and the occupational system. The first element is the changing attributes that occur as career decisions are modified through an individualistic information system. The second element is termed "curriculums based on occupational

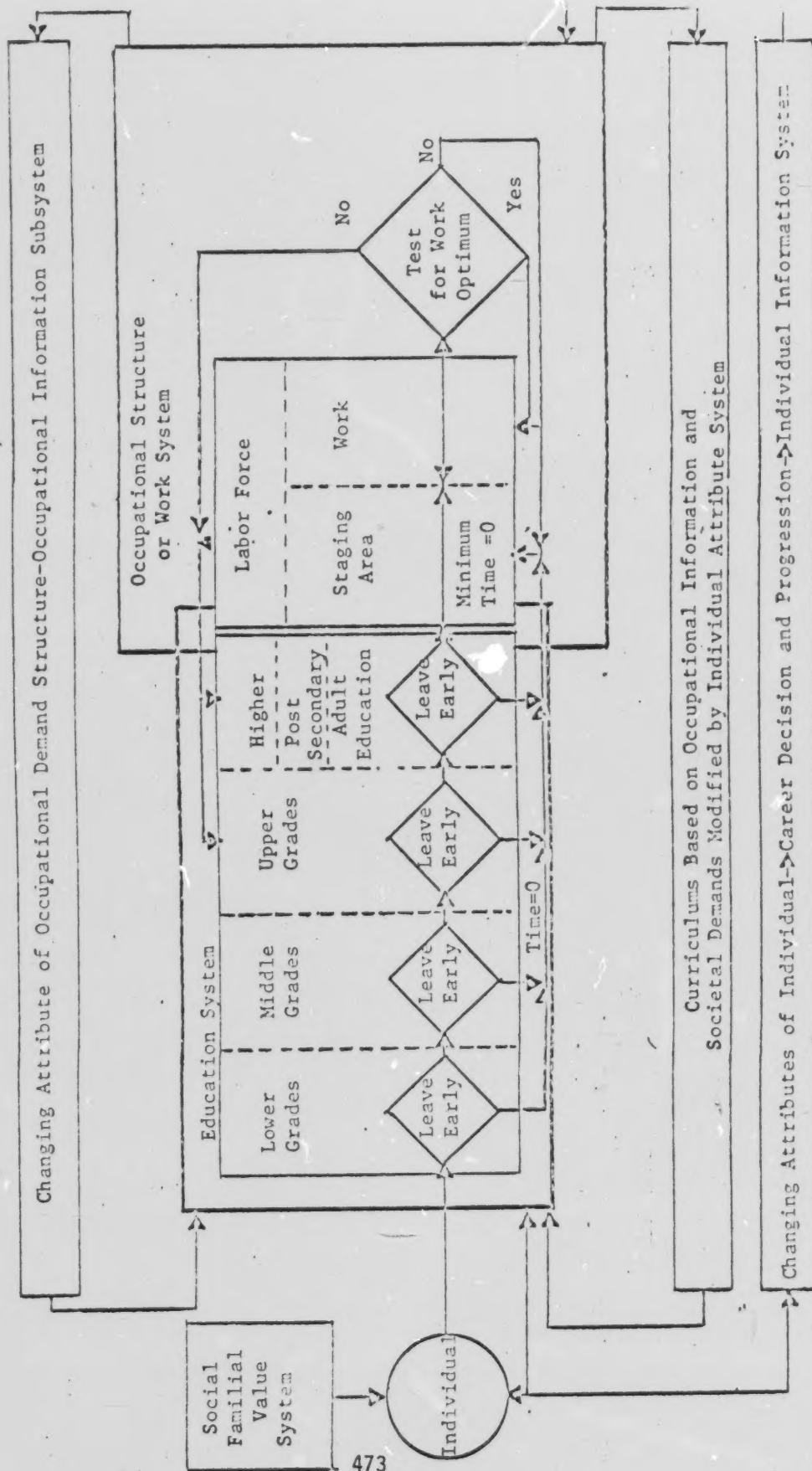


FIGURE 18. A MODEL FOR EDUCATION FOR OCCUPATIONAL PROFICIENCY

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information and societal demands modified by the individual attribute system." The third element is the changing attributes of the occupational demand structure.⁶⁰

David Kidder⁶¹ recently reviewed the entire field of manpower forecasting for vocational-technical education.

Kidder classified the modeling techniques being used in manpower education research in the following manner:

1. Unspecified: Usually data-generated techniques, the assumptions and structures of which are not spelled out. Included are Area Skill Surveys, Medvin's "Unfielded Openings" Model, and other techniques that make simple projections and technological forecasts.⁶²

2. Specified technological models: Models in this category consider fixed production coefficients, reacting to relative resource costs. Assumptions may or may not be spelled out, and technological forecasts may vary in complexity from simple extrapolations to complex input-output projections. Examples of this technique are cited by Kidder as, The State of California's Study, "Manpower for California Hospital 1964-1965, the Input-Output Models developed by BLS, Walter Arnold's Pennsylvania study 1969 and the Occupational Training Information System (OTIS) from Oklahoma.⁶³

3. Specified economic models: These are systems developed to identify employer and worker behavior under the economic assumptions of maximizing net benefits from some activity. Measured parameters are used to best approximate optimal solutions using linear programming and cost/benefit approaches. Kidder cites examples of these techniques as models developed by McNamara and Maki.⁶⁴

4. Specific predictive models: This modeling concept requires the use of functions such as least squares regression estimates of supply - demand forces in a labor market. Kidder cites Mehmet and Cummings as examples of this type of modeling.⁶⁵

FACTORS RELATED TO THE DECISION MODEL DEVELOPMENT

The most widely accepted evaluation procedure for vocational education has centered upon input factors into the educational process such as organizational structures, equipment and facilities. This traditional educational evaluation process concentrates upon program input standards rather than program outcomes.⁶⁶

Researchers in the states of Oklahoma, Minnesota, Texas, Ohio, Iowa, and Pennsylvania as reported by Mudzo, have actively attempted to develop statewide manpower planning systems which will improve the effectiveness of vocational education from a statewide approach.⁶⁷

Most work however, has been in the area of developing techniques that will allow the gathering of necessary data for manpower planning decisions, while relatively little effort has gone into identifying variables and establishing their relationships to vocational education as a developer of workforce manpower. There is general agreement, however, among vocational education researchers that a systematic approach to the problem of interfacing vocational education planning with manpower needs is necessary.⁶⁸

Occupational Choices

Representing the Bureau of Labor Statistics, Smith, Crowley, and Rosenthal⁶⁹ in discussing traditional methods of making individual occupational choices report that most education and training in the United States has been offered by schools and institutions responding to student interest. Underlying the development and the employment of manpower resources rests a great many individual decisions made to suit individual interests, opportunities and capabilities.⁷⁰

Educational and governmental decisions also tend to influence individual choices, such as a decision to construct an Area Vocational-Technical School, the establishment of certain training programs, the revision of draft laws, or the changing of the occupational salary structure making one occupation more attractive than another.

Smith, Crowley, and Rosenthal⁷¹ indicate that while the system is based upon individual choices, it has functioned reasonably well.

However, the ability of the system to work has depended on the flexibility of employers, workers, and educational and training institutions. Employers have adjusted their operations to the available labor supply through a variety of methods including restructuring their work when skilled workers were in short supply; upgrading or training workers on the job; or substituting machinery for scarce labor. Workers have adjusted to the needs of employers, sometimes in response to relative wage levels among occupations, by taking training or moving. Educational and training institutions have responded to changing manpower needs, both in the initial training of workers and in retraining and upgrading programs.⁷²

Despite identifiable success the market has functioned less than perfectly. At any one time, occupations in the labor market will be in need of manpower while in other occupations surpluses exist. As an example, health officials have complained of shortages of physicians and nurses; consumers

call for more and better auto mechanics, while industry needs more engineers, technicians, and other highly trained workers.

According to Smith, Crowley, and Rosenthal,⁷³ the labor market adjusts slowly to changes in demand for occupations that require long training periods. For a rapidly changing market the effect is a disproportionate rise in wage levels which result in higher costs. This is indicated by the rapid increase in health care and the inability of people to meet the health care cost. America's seemingly slow ability to combat environmental pollution is an example of education and training slowly adjusting to social demands. In the face of rising demand, shortages of trained workers are strong contributors to inflationary pressures.⁷⁴

These factors indicate the need for educational planning and training, especially when the government contributes to rapidly rising manpower needs by mounting large programs such as highway construction or space exploration. Such programs create shortages of trained workers that affect industry and threaten the effectiveness of the government's own programs.⁷⁵

In legislation that provides funds for training and education, has been very explicit in indicating that manpower training must be based upon future manpower needs.

In the Vocational Education Amendments of 1968, Congress declared the purpose of the Act to include assurance that individuals who need it will have "ready access to vocational training or retraining . . . which is realistic in the light of actual anticipated opportunities for gainful employment."⁷⁶

The Manpower Development and Training Act of 1962, states that "improved planning and expanded efforts will be required to assure that men, women, and young people will be trained and available to meet shifting employment needs; that many persons now unemployed or underemployed, in order to become qualified for reemployment or full employment, must be assisted in providing themselves with skills which are or will be in demand in the labor market."⁷⁷

Emerging Occupations

Norman Medvin,⁷⁸ writing for the Department of Labor indicated that new and emerging occupations have very little effect upon the total manpower demand. He reported that research supports the notion that the importance placed upon emerging occupations in terms of training needs is a myth given

substance by the idea that it is all elusive but important in planning future manpower needs.

Medvin further reports that the job structure changes rather slowly and that the overwhelming number of jobs and subsequent opportunities are in existing occupations. Most new industries call largely for existing skills. Emerging skills occur in very small numbers and when they do, the workers is usually trained for the job by the employer.⁷⁹

Planning Needs for Vocational Education

Several nationally known leaders in vocational education have expressed themselves concerning planning needs. Melvin Barlow⁸⁰ wrote that vocational education efficiency is one of the most important factors to be considered when determining the total manpower resources of our country. He further stated that vocational education is available to a large majority of the labor force. However, the enrollment record indicates that vocational education has not provided all the job training it is capable of providing. Furthermore, such training has not always matched critical employment needs.⁸¹

The relationship of vocational education to manpower and employment often has been misunderstood. This misunderstanding stems from a vast array of complexities, including parental attitudes, lack of adequate financing, and the general failure of the schools and the public to recognize that preparation for occupational life is a legitimate function of public education. Barlow maintained that vocational education is not without sin in the matter of manpower and employment but that these two factors are central to the existence of vocational education. The efficiency of relating these two factors dictates the success of the application of the principles of vocational education.⁸²

Grant Venn⁸³ stated that technological change will continue as a master of all or as a servant for all. The current overriding necessity of education is to prepare youth and adults to use technological advancement for the benefit of every individual and the strengthening of our total society. Education is the best means by which the individual and society can adjust to technological change. The real task is to make education the driving force in equipping all youth and adults to meet the technological explosion already so far advanced.

Venn continued that the new technology has removed the margin for educational error. Historically, the number and kinds of jobs available to the uneducated and undereducated permitted schools and colleges a "margin for error" in planning educational programs and providing educational opportunities. Today, however, the inability of a technological society to make full use of uneducated individuals narrows the margin to the point where the repercussions of each educational failure can be felt throughout the entire society.⁸⁴

The President's Commission on School Finance⁸⁵ reported that a serious inadequacy of educational planning at national and state levels has resulted in the failure of local schools to relate curriculum and counseling to long-range employment opportunities. The commission further reported that in 1970-71 there were 2,450,000 students who left the formal educational system ill-prepared to offer any productive skills to prospective employers.

The 1970 State Educational Evaluation of Kansas⁸⁶ reported that the availability of vocational education in Kansas appeared to be optional in areas of population greater than 5,000 but less than 50,000. It was found that 15.7 percent of secondary school students were enrolled in some type of vocational education course and that approximately 3 percent of the 1968 high school graduates had enrolled in vocational and technical schools.

When students were asked how well they felt the schools were preparing them for the world of work, they indicated that they desired more vocational education. Two-thirds of the students in grades eight, ten, and twelve, wanted more vocational education classes. When asked to name one thing that should be improved in their school, students in the task force research group sample mentioned "better vocational-technical programs" third most often. The first and second most frequent responses were "improved student-teacher relationships" and "freedom of students to express their opinion about things in school."⁸⁷

The report drew inferences that the data indicated that the main needs in vocational education in Kansas were: (1) to employ more vocational counselors; (2) to create more up-to-date vocational curriculum based upon job needs in the community, region, and state; and, (3) to emphasize within the vocational curriculum, educational materials that are indicative of the fields in which graduates will be employed.⁸⁸

SUMMARY

Most writers in the area of vocational education research and evaluation feel that vocational education is not without sin in the matter of manpower and employment. Vocational education seems to be unable to maintain the constant and rapid change necessary to keep pace with student employment opportunity.

Changes in the labor market have caused problems for vocational education. The development of an educational institution keyed to a dynamic labor force does not alter vocational education philosophy but indicates that tools to do so are not readily available to vocational education managers. The evaluation techniques developed by Moss and the Model for Occupational Education are steps toward the development of the necessary tools to move the vocational education system.

Progress has been made in recent years in developing techniques for identifying manpower needs. Kidder's classification of manpower modeling techniques into unspecified, specified technological models, specified economic models, and specified predictive models illustrates the fact that manpower research has developed into a broad, sophisticated area of research that is quite valuable to the vocational education planner.

Appropriate vocational education planning in relation to manpower needs will promote individual choices that will tend to satisfy both employment demand and individual goals. Several writers and researchers are calling for greater national effort to be put into vocational education program planning that will result in bringing the educational sector and employment demand into sharper focus.

Kansas students tend to follow national trends in demanding additional educational programs that would provide learning experience to enable their moving from the educational system directly into the workforce in an efficient manner.

FOOTNOTES

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²Ibid., p. 170.

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⁴Ibid., p. 156.

⁵Ibid., p. 154.

⁶Ibid., p. 156.

⁷Ibid., p. 158.

⁸Ibid., p. 229.

⁹Ibid.

¹⁰Vocational Technical Terminology, (Washington: American Vocational Association, 1970), p. 9.

¹¹U.S., Standard Terminology for Instruction in Local and State School Systems, op. cit., p. 229.

¹²Ibid.

¹³Ibid.

¹⁴Ibid., p. 230.

¹⁵Ibid., p. 231.

¹⁶Ibid., p. 195.

¹⁷Ibid., p. 225.

¹⁸Ibid., p. 195.

¹⁹Ibid., p. 230.

²⁰Ibid., p. 235.

²¹Ibid., p. 232.

- ²²Ibid., p. 170.
- ²³Ibid., p. 230.
- ²⁴Ibid., p. 172.
- ²⁵Ibid., p. 232.
- ²⁶Ibid.
- ²⁷Ibid., p. 233.
- ²⁸Ibid., p. 236.
- ²⁹Ibid., p. 233.
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- ³⁴Saul I. Gass, Linear Programming (New York: McGraw-Hill Book Co., 1969), p. 3.
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- ³⁶Ibid., p. 231.
- ³⁷Ibid., p. 230.
- ³⁸Ibid., p. 231.
- ³⁹Ibid., p. 236.
- ⁴⁰Ibid., p. 232.
- ⁴¹Ibid., p. 235.
- ⁴²Ibid., p. 223.
- ⁴³Ibid., p. 237.
- ⁴⁴Ibid., p. 228.
- ⁴⁵Ibid., p. 172.
- ⁴⁶Ibid., p. 237.

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- ⁵⁶Ibid.
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- ⁵⁸John Coster, Robert Morgan, and John Dane, "The Curriculum Problem and National Goals," Contemporary Concepts in Vocational Education, American Vocational Association Yearbook (Washington: American Vocational Association, 1971), p. 88.
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- ⁶⁰Ibid.
- ⁶¹David E. Kidder. Review and Synthesis of Research on Manpower Forecasting for Vocational Education, (Columbus, Ohio: Ohio State University, February, 1972), pp. 33-35.
- ⁶²Ibid.
- ⁶³Ibid.
- ⁶⁴Ibid.
- ⁶⁵Ibid.
- ⁶⁶M. G. Mudzo. "The Development of a Decision Model for Statewide Manpower Planning Related to Vocational Technical Education." (unpublished Doctor's dissertation, Oklahoma State University, 1970), p. 1.

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⁶⁹C. Gerard Smith, Michael F. Crowley, and Neal H. Rosenthal. Occupational Manpower and Training Needs, Bulletin 1701. (Washington: Department of Labor, 1971), pp. 1-2.

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⁷⁵Ibid.

⁷⁶U.S., Vocational Education Amendments of 1968, 90th Congress, H. R. 18366, Public Law 90-576.

⁷⁷U.S., Congress. Manpower Development and Training Act of 1962, 87th Congress, 2nd Session, S. 1991, Public Law 87-415.

⁷⁸Norman Medvin, "Forecasting Occupational Job Requirements," Employment Service Review. U.S. Department of Labor Administration, January - February, 1967, p. 64.

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⁸²Ibid.

⁸³Grant Venn. Man, Education, and Work, (Washington: American Council on Education, 1964), pp. 158-175.

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⁸⁶Kansas, State Educational Evaluation of Kansas, Vol. IV, "Report of Project SEEK." (Topeka: Kansas State Department of Education, 1970), pp. 10-11.

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Chapter 38

DEVELOPMENT OF THE MODEL AND RELATED FUNCTIONS AND VARIABLES

The development of a mathematical model to determine an optimal program mix for a vocational education institution service area involved the identification of variables that tended to determine and/or restrict the vocational and technical education program mix for the area. A structured manipulation of these variables in turn yielded the optimum program mix relative to some pre-determined goal.

Variables that affected the model were divided into two functions as illustrated in Figure 19. The guidance and instructional function was a broad classification of activities that related directly to students as they moved through the educational system toward employment.

The administrative function was a classification given to those management activities that formulated operational policy for the instructional agency. The policies manipulated and gave direction to the guidance and instructional function. One restriction on this function was that vocational and technical education managers must make decisions that comply with legislative mandates outlining the mode of educational activity.

The two functions tended to be related especially as they were viewed in the planning process. For example, a vocational and technical education administrator while reacting to employment opportunity data in planning a high-cost training program must rely on the guidance services to deliver trainees into the program as well as the instructional program capability relative to adequate preparation of individuals for entry into employment.

SUPPLY AND DEMAND VARIABLES

The two broad overriding variables which must be considered in all manpower planning are manpower supply and manpower demand as illustrated in Figure 19.

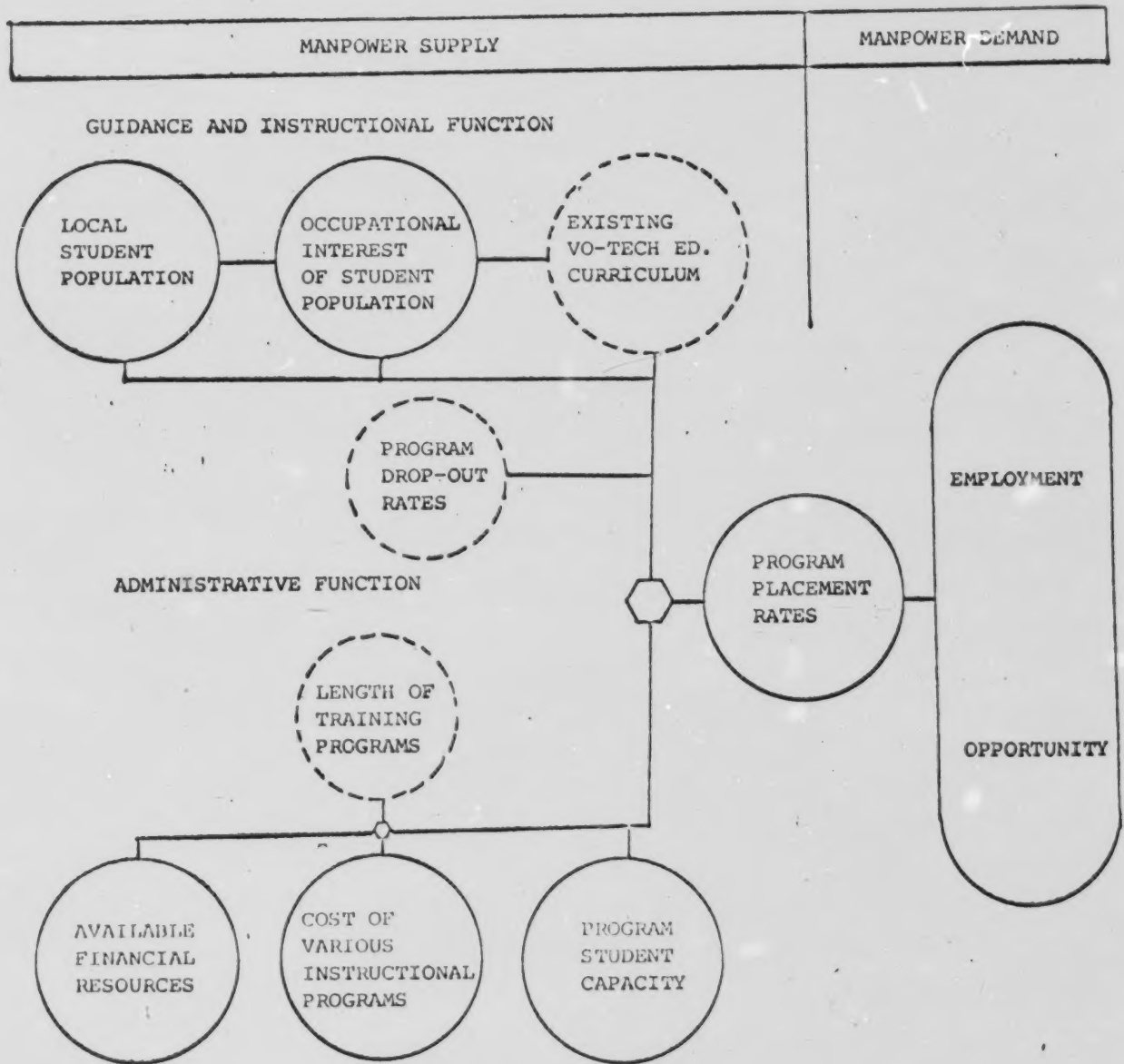


FIGURE 19. AN ILLUSTRATION OF VARIABLE RELATIONSHIPS

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Mudzo¹ defined manpower demand as the total number of measured or projected job vacancies which exist during the period of time under consideration, categorized according to a specific skill or skill cluster. Mudzo² also defined manpower supply as the total number of measured or projected skilled persons employed or available for employment during the time period under consideration, categorized according to a specific skill or skill cluster.

Demand implies a need for a specific skill and supply implies a need satisfier with a specific skill from a known source. The interfacing of demand and supply determined the net manpower requirement for a specific time and for a specific geographic area.

The data in this study that represents the supply and demand variables has been calculated by the Kansas Manpower Utilization System for Training Project.³

Supply and Demand Modifying Variables Related to the Model

Variables identified for manipulation within the model were: (1) cost per program, (2) total available vocational and technical education financial resources, (3) number of students interested in a particular program, (4) number of programs needed to meet manpower needs, (5) number of students a particular program can serve, (6) the total student population that will not complete higher education, and (7) number of students expected to be placed into employment for which they are trained.

Variables implicit in the model were: dropout rate (implied through placement rate), existing vocational and technical education curriculum (implied through program cost data), and length of each training program (implied through program cost data).

In equation form, the variables were written as:

$$PM = f(PC, AF, SI, MN, PC, SP, PR)$$

where:

PM = the vocational and technical education program mix.

f = the function indicator.

PC = the cost of each program.

AF = available financial resources.

SI = student interest.

MN = the number of programs needed to meet manpower need.

PC = the program student capacity.

SP = the student population.

PR = the number of students expected to be placed into employment for which they are trained.

Linear Programming

Several statistical applications were considered for model development, however, linear programming was selected as the technique that offered the greatest probability for satisfactory solution. Linear programming is considered to be a tool of modern theoretical and applied mathematics, concerning itself with the efficient use or allocation of limited resources to meet desired objectives where solutions satisfy both the conditions of the problem and the given objective in terms of the most optimum solution. The optimum solution is either maximized or minimized subject to a linear combination of variables that are written as constraints to restrict the variable manipulation.⁴

Constraints Related to the Model

Six sets of constraints representing pre-selected variables were derived to serve as inputs into the linear programming decision-making model. These constraints represented either restricting or optimizing factors in the determination of an optimal vocational and technical education program mix for a given service area.

Restricting factors included: (1) cost per program, (2) total available vocational and technical education financial resources, (3) number of students interested in a particular type of training, (4) number of programs needed to meet manpower demands, (5) the number of students that a program can serve and, (6) the total student population to be served. The optimizing factor was the number of students expected to be placed into employment for which they were trained.

THE LINEAR PROGRAMMING MODEL

The linear programming model used in this study determined the optimum program mix in terms of that program mix which places the largest

possible number of students in the work force. Constraints on the model were designed to reflect values of other applied variables.

The equation maximized by this model was:

$$C_1X_1 + C_2X_2 + \dots + C_iX_i + \dots + C_{119}X_{119}$$

where:

C_i equaled the number of students placed annually from a program of type i (Note: C_{51} through C_{119} equaled zero), and X_i equaled the number of type i programs projected by this model where i was less than or equal to 50 and equaled slack variables where i was greater than 50.

Constraints on the system included the standard constraint equations which restricted all X_i to values greater than or equal to zero plus the following special constraint equations.

$$(1) a_{1,1}X_1 + a_{1,2}X_2 + \dots + a_{1,i}X_i + \dots + a_{1,119}X_{119} = b_1$$

where:

$a_{1,1}$ through $a_{1,50}$ were Average Annual costs of program types 1 through 50 respectively, $a_{1,51}$ equaled one, $a_{1,52}$ through $a_{1,119}$ equaled zero and b_1 was the total financial resources available to finance the optimum program mix.

$$(2) a_{2,1}X_1 + a_{2,2}X_2 + \dots + a_{2,j}X_j + \dots + a_{2,119}X_{119} = b_2$$

where:

$a_{2,j}$ was the estimated enrollment in program j if program j was in the Technical Cluster, otherwise $a_{2,j}$ equaled zero except for $a_{2,52}$ which equaled one, and b_2 equaled the estimated number of students in the potential student population who were interested in technical training.

$$(3) a_{3,1}X_1 + a_{3,2}X_2 + \dots + a_{3,j}X_j + \dots + a_{3,119}X_{119} = b_3$$

where:

$a_{3,j}$ was the estimated enrollment in a typical j type program if j was in the Clerical Cluster, otherwise, $a_{3,j}$ equaled zero except for $a_{3,53}$ which equaled one, and b_3 equaled the estimated number of students in the potential student population who were interested in clerical training.

$$(4) a_{4,1}X_1 + a_{4,2}X_2 + \dots + a_{4,j}X_j + \dots + a_{4,119}X_{119} = b_4$$

where:

$a_{4,j}$ was the estimated enrollment in a typical j type program if j was in the Medical Cluster, otherwise, $a_{4,j}$ equaled zero except for $a_{4,54}$ which equaled one, and b_4 equaled the estimated number of students in the potential student population who were interested in medical training.

$$(5) \quad a_{5,1}x_1 + a_{5,2}x_2 + \dots + a_{5,j}x_j + \dots + a_{5,119}x_{119} = b_5$$

where:

$a_{5,j}$ was the estimated enrollment in a typical j type program if j was in the Mechanics and Repairmen Cluster, otherwise, $a_{5,j}$ equaled zero except for $a_{5,55}$ which equaled one, and b_5 equaled the estimated number of students in the student population who were interested in mechanic and repairmen training.

$$(6) \quad a_{6,1}x_1 + a_{6,2}x_2 + \dots + a_{6,j}x_j + \dots + a_{6,119}x_{119} = b_6$$

where:

$a_{6,j}$ was the estimated enrollment in a typical j type program if j was in the Metal Craftsmen Cluster, otherwise, $a_{6,j}$ equaled zero except for $a_{6,56}$ which equaled one, and b_6 equaled the estimated number of students in the potential student population who were interested in metal crafts training.

$$(7) \quad a_{7,1}x_1 + a_{7,2}x_2 + \dots + a_{7,j}x_j + \dots + a_{7,119}x_{119} = b_7$$

where:

$a_{7,j}$ was the estimated enrollment in a typical j type program if j was in the Sales Cluster, otherwise, $a_{7,j}$ equaled zero except for $a_{7,57}$ which equaled one, and b_7 equaled the estimated number of students in the student population who were interested in sales training.

$$(8) \quad a_{8,1}x_1 + a_{8,2}x_2 + \dots + a_{8,j}x_j + \dots + a_{8,119}x_{119} = b_8$$

where:

$a_{8,j}$ was the estimated enrollment in a typical j type program if j was in the Service Worker Cluster, otherwise, $a_{8,j}$ equaled zero except for $a_{8,58}$ which equaled one, and b_8 equaled the estimated number of students in the student population who were interested in service work training.

$$(9) \quad a_{9,1}x_1 + a_{9,2}x_2 + \dots + a_{9,j}x_j + \dots + a_{9,119}x_{119} = b_9$$

where:

$a_{9,j}$ was the estimated enrollment in a typical j type program if j was in the Construction Cluster, otherwise, $a_{9,j}$ equaled zero except for

$a_{9,59}$ which equaled one, and b_9 equaled the estimated number of students in the student population who were interested in construction training.

$$(10) \quad a_{10,1}X_1 + a_{10,2}X_2 + \dots + a_{10,j}X_j + a_{10,119}X_{119} = b_{10}$$

where:

$a_{10,j}$ was the estimated enrollment in a typical j type program if j was in the Agriculture Cluster, otherwise, $a_{10,j}$ equaled zero except for $a_{10,60}$ which equaled one, and b_{10} equaled the estimated number of students in the student population who were interested in agriculture training.

$$(11) \quad a_{11,1}X_1 + a_{11,2}X_2 + \dots + a_{11,j}X_j + \dots + a_{11,119}X_{119} = b_{11}$$

where:

$a_{11,j}$ was the estimated enrollment in a typical j type program if j was in the Drivers and Deliverymen Cluster, otherwise, $a_{11,j}$ equaled zero except for $a_{11,61}$ which equaled one, and b_{11} equaled the estimated number of students in the student population who were interested in driver and delivery training.

$$(12) \quad a_{12,1}X_1 + a_{12,2}X_2 + \dots + a_{12,j}X_j + \dots + a_{12,119}X_{119} = b_{12}$$

where:

$a_{12,j}$ was the estimated enrollment in a typical j type program if j was in the Textile Occupation Cluster, otherwise, $a_{12,j}$ equaled zero except for $a_{12,62}$ which equaled one, and b_{12} equaled the estimated number of students in the student population who were interested in textile occupations training.

$$(13) \quad a_{13,1}X_1 + a_{13,2}X_2 + \dots + a_{13,j}X_j + \dots + a_{13,119}X_{119} = b_{13}$$

where:

$a_{13,j}$ was the estimated enrollment in a typical j type program if j was in the Food Cluster, otherwise, $a_{13,j}$ equaled zero except for $a_{13,63}$ which equaled one, and b_{13} equaled the estimated number of students in the student population who were interested in food service training.

$$(14) \quad a_{14,1}X_1 + a_{14,2}X_2 + \dots + a_{14,j}X_j + \dots + a_{14,119}X_{119} = b_{14}$$

where:

$a_{14,j}$ was the estimated enrollment in a typical j type program if j was in the Protective Service Cluster, otherwise, $a_{14,j}$ equaled zero except for $a_{14,64}$ which equaled one, and b_{14} equaled the estimated number of students in the student population who were interested in protective service training.

$$(15) \ a_{15,1}X_1 + a_{15,2}X_2 + \dots + a_{15,j}X_j + \dots + a_{15,119}X_{119} = b_{15}$$

where:

$a_{15,j}$ was the estimated enrollment in a typical j type program if j was in the Transportation and Public Utilities Cluster, otherwise, $a_{15,j}$ equaled zero except for $a_{15,65}$ which equaled one, and b_{15} equaled the estimated number of students in the student population who were interested in transportation and public utilities training.

$$(16) \ a_{16,1}X_1 + a_{16,2}X_2 + \dots + a_{16,j}X_j + \dots + a_{16,119}X_{119} = b_{16}$$

where:

$a_{16,j}$ was the estimated enrollment in a typical j type program if j was in the Printing Craftsmen Cluster, otherwise, $a_{16,j}$ equaled zero except $a_{16,66}$ which equaled one, and b_{16} equaled the estimated number of students in the student population who were interested in printing crafts training.

$$(17) \ a_{17,1}X_1 + a_{17,2}X_2 + \dots + a_{17,j}X_j + \dots + a_{17,119}X_{119} = b_{17}$$

where:

$a_{17,j}$ was the estimated enrollment in a typical j type program when j was less than or equal to 50 (Note: the model considered 50 possible program types) while all other $a_{17,j}$'s equaled zero with the exception of $a_{17,67}$ which equaled 1, and b_{17} equaled the number of students to be served.

$$(18) \ a_{18,1}X_1 + a_{18,2}X_2 + \dots + a_{18,j}X_j + \dots + a_{18,119}X_{119} = b_{18}$$

where:

$a_{18,j}$ was the estimated female enrollment in a typical j type program when j was less than or equal to 50 and was equal to zero in all other cases except $a_{18,68}$ which equaled one, and b_{18} equaled the expected number of females to be served.

$$(19) \ a_{19,1}X_1 + a_{19,2}X_2 + \dots + a_{19,j}X_j + \dots + a_{19,119}X_{119} = b_{19}$$

where:

$a_{19,j}$ was the estimated male enrollment in a typical j type program when j was less than or equal to 50 and was equal to zero in all other cases except $a_{19,69}$ which equaled one, and b_{19} equaled the expected number of males to be served.

$$(i) \ a_{i,1}X_1 + a_{i,2}X_2 + \dots + a_{i,j}X_j + \dots + a_{i,119}X_{119} = b_i$$

where:

i varied from 20 through 69, $a_{i,j}$ equaled zero except where i equaled j or where i equaled $j + 50$ in which cases $a_{i,j}$ equaled one, and b_i equaled the maximum number of programs which the manpower demand for this program could support or the number of sites whichever was smaller.

Special equation 1 restricted the expenditures of the optimum program mix to the available budget, special equations 2 through 16 restricted possible enrollment in programs to the number of students estimated to be interested in that type of training, equation 17 restricted total enrollment to the total number of students served, equation 18 restricted the number of male training slots to the number of females to be served, equation 19 restricted the number of male training slots to the number of males expected to be served, and equations 20 through 69 restricted enrollment in a program type to the number of programs which could be supported by manpower demands in the area to be served or the number of possible sites whichever was smaller.

SUMMARY

The development of a model to determine the optimum program mix in a given geographical area involved identifying variables that tended to determine or restrict the program mix. A structured manipulation of these variables yielded the optimum program mix relative to a predetermined goal, for example, maximization of number of students placed.

Variables identified for manipulation within the model were (1) cost per program, (2) total available vocational and technical education financial resources, (3) number of students interested in particular programs, (4) number of programs of certain types needed to meet manpower needs, (5) number of students a particular program could serve, (6) total student population to be served, and (7) number of students expected to be placed into employment for which they were trained. Variables implicit in the model were dropout rate (implied in placement rate) and length of training program (implied through program cost data).

Several approaches were considered in the model development and linear programming was selected as the most feasible alternative. Linear programming concerns itself with the efficient use or allocation of limited resources to meet desired objectives where solutions satisfy both the conditions of the

problem (constraints) and the given objective in terms of the most optimum solution.

The objective to be optimized could be any one of several variables. Possibly some of the more feasible objectives would be to maximize the number of students placed in occupations related to their training, the number of disadvantaged and handicapped students enrolled, or societal cost/benefit ratios.

The linear programming model presented in this study determined the optimum program mix for placing the largest possible number of students in the work force given constraints of money available, students available, etc. (Note: Any other feasible objective could easily be substituted into this model).

FOOTNOTES

¹M. G. Mudzo, "The Development of a Decision Model for Statewide Manpower Planning Related to Vocational Technical Education" (unpublished Doctor's dissertation, Oklahoma State University, 1970).

²Ibid.

³Kansas, Handbook for Vocational and Technical Education Planners, Cycle II Report, (Manhattan, Kansas; Division of Vocational Education, 1973).

⁴Saul I. Gass, Linear Programming (New York: McGraw-Hill Book Co., 1969), p. 3.

Chapter 39

PRACTICAL APPLICATION OF THE MODEL IN DETERMINING AN OPTIMAL VOCATIONAL AND TECHNICAL EDUCATION PROGRAM MIX

The set of mathematical expressions developed in Chapter 3 may be a powerful decision making tool for vocational and technical education planners when used with data that effectively represent the true conditions of student interest, employment opportunity, manpower demand, available finances for vocational technical education, the number of students expected to enroll in each program, the operational cost of each program, and the expected number of students to be placed into the work force as an output from each training program. This chapter presents two applications of the model. Application number one involves the Central Kansas Area Vocational Technical School service area, while the second application involves the State of Kansas.

DATA SOURCES

Data was collected for two test applications of the model. Application number one consisted of applying the model to data representing the Central Kansas Area Vocational Technical School service area (Harvey, Reno, and McPherson Counties). Data for test number one is found in Table 41. Application number two consisted of applying the model to data representing the State of Kansas. Data for this test is presented in Table 42. Solutions or model application outcomes should indicate the best vocational and technical education program mix for the Central Kansas AVTS area and the State of Kansas relative to optimizing placement under the restrictions of cost of program, available financial resources, student interest, manpower needs, program student capacity, number of students to be served, and placement rates.

Program Cost

For test number one, the program cost data has been derived from the Central Kansas AVTS budgets for fiscal year 1971-1972. The data reflects

Table 41

CKAVTS Vocational Technical Education Program
for the Central Kansas Area

Programs	Expected Cost Per Program	Expected Enrollment Per Program	Expected Placement Per Program	Number of Programs Needed to Meet Manpower Demand
Production Ag	13,088	33	11	2
Ag Mechanics*	16,000	14	8	1
Horticulture and Ag Resources	17,780	14	8	1
Ag Sales and Service*	13,000	12	9	3
Dist. Ed, Sales and Serv.	14,755	27	12	3
Transportation	18,000	18	14	1
Dental Assistants*	24,932	21	16	0
Dental Hygienist*	68,071	22	16	0
Dental Lab Technician*	65,000	20	15	0
LPN Training	14,242	8	8	3
Medical Assistant*	15,350	13	10	2
Medical Lab Assistant*	28,979	16	12	1
Medical Record Secretary	17,824	15	8	0
Child Care and Guidance*	12,600	10	8	3

Table 41(continued)

Programs	Expected Cost Per Program	Expected Enrollment Per Program	Expected Placement Per Program	Number of Programs Needed to Meet Manpower Demand
Clothing Mgmt. Prod. and Serv.*	12,520	10	8	3
Food Mgmt. Prod. and Serv.*	12,610	12	8	3
Secretary/Steno	18,981	22	18	3
Accounting and Computing*	18,000	18	14	3
Office Machines and Key Punch*	18,000	18	14	1
Data Processing*	18,000	18	14	1
Material Support*	18,000	18	14	0
Communications*	10,986	28.0	21	1
Typing and Other Clerical	22,132	28.5	20	3
Civil Technology	9,684	20.20	15	1
Electronics Technology	17,131	18.4	8	0
Police Science	20,039	9.0	8	1
Air Conditioning*	12,750	12.0	9	1
Appliance Repair*	12,184	18.0	14	3
Auto Body*	25,300	35.0	26	0
Auto Mechanics	19,905	12.0	8	1
Aviation Occupations*	39,178	31.0	23	0
Commercial Art*	22,805	32.0	24	0
Photography*	12,829	21.0	16	0

Table 41 (continued)

Programs	Expected Cost Per Program	Expected Enrollment Per Program	Expected Placement Per Program	Number of Programs Needed to Meet Manpower Demand
Carpentry	13,708	9.0	8	3
Electricity	15,435	12.0	6	2
Masonry*	12,050	14.0	11	1
Plumbing*	16,765	19.0	14	1
Diesel Mechanic*	31,976	20.0	15	0
Drafting	21,422	11.0	4	2
Lineman*	26,030	31.0	23	0
Electronics Voc.*	17,127	19.0	14	1
Radio and TV Mech.*	13,486	16.0	12	0
Graphic Arts	16,969	11.32	7	1
Welding*	18,947	24.0	18	1
Machine Shop	18,092	31.0	18	1
Sheet Metal*	12,750	18.0	13	1
Cosmetology*	18,572	22.0	17	2
Small Engines*	12,982	33.0	25	0
Truck Driving*	41,388	24.0	18	1
Heavy Equipment*	59,194	38.0	29	0

*Data taken from State averages since no CKAITS program existed.

Table 42

Kansas Vocational Technical Education Program Data

Programs	Expected Cost Per Program	Expected Enrollment Per Program	Expected Placement Per Program	Number of Programs Needed to Meet Manpower Demand
Production Ag	14,000	14	8	20
Ag Mechanics	16,000	14	8	18
Horticulture and Ag Resources	16,000	14	8	20
Ag Sales and Service	13,000	12	9	20
Dist. Ed, Sales and Service	14,000	18	12	20
Transportation	18,000	18	14	20
Dental Assistants	24,932	21	16	9.5
Dental Hygienist	68,071	22	16	5
Dental Lab Technician	65,000	20	15	2
LPN Training	52,595	40	30	20
Medical Assistant	15,350	13	10	20
Medical Lab Assistant	28,979	16	12	8.5
Medical Record Secretary	12,574	22	16	1
Child Care and Guidance	12,600	10	8	20
Clothing Mgmt. Prod. and Service	12,520	10	8	20

Table 42 (continued)

Programs	Expected Cost Per Program	Expected Enrollment Per Program	Expected Placement Per Program	Number of Programs Needed to Meet Manpower Demand
Food Mgmt. Prod. and Service	12,610	12	8	20
Secretary/Steno	18,000	18	14	20
Accounting and Computing	18,000	18	14	20
Office Machines and Key Punch	18,000	18	14	20
Data Processing	18,000	18	14	20
Material Support	18,000	18	14	4
Communications	10,986	28.0	21	20
Typing and Other Clerical	18,000	18.0	14	20
Civil Technology	9,684	20.20	15	11.5
Electronics Technology	20,100	22.6	17	5.5
Police Science	5,039	9.3	7	20
Air Conditioning	12,750	12.0	9	8.5
Appliance Repair	12,184	18.0	14	7.5
Auto Body	25,300	35.0	26	1
Auto Mechanics	29,348	32.0	24	4
Aviation Occupations	39,178	31.20	23	0
Commercial Art	22,805	31.90	24	0
Photography	12,829	21.0	16	2
Carpentry	18,668	11.30	8	20
Electricity	16,665	21.0	16	8.5

Table 42(continued)

Programs	Expected Cost Per Program	Expected Enrollment Per Program	Expected Placement Per Program	Number of Programs Needed to Meet Manpower Demand
Masonry	12,050	14.0	11	5
Plumbing	16,765	19.0	14	11.5
Diesel Mech.	31,976	19.50	15	8.5
Drafting	19,624	23.40	18	4
Lineman	26,030	23	23	7.5
Electronics Voc.	17,127	19.0	14	7.5
Radio and TV Mech.	13,486	16.40	12	0
Graphic Arts	21,394	14.6	11	14
Welding	18,947	24.0	18	20
Machine Shop	14,855	19.7	15	70
Sheet Metal	12,750	17.6	13	13
Cosmetology	18,572	22.4	17	0
Small Engines	12,982	33.0	25	3
Truck Driving	41,388	24.0	18	20
Heavy Equipment	59,194	38.0	29	5

that portion of the budget computed for reporting to the State Department of Education (see Table 41). For test two, program cost data has been supplied by the State Department of Education and represents an average cost of operation for all like programs within Kansas taken from budgets of fiscal year 1971-1972 (see Table 42).

Available Financial Resources

For test number one, available financial resources represent the local funding, state funding, and federal funding now being used in the Central Kansas Area. This figure is \$798,987.00. For test number two, all money spent in the state that applies to vocational education programming covered by this study was used. This figure is \$16,841,838.00.

Student Interest

The number of students interested in a particular type of training was estimated by multiplying the number of high school juniors and seniors who will not pursue a college degree¹ times a set of percentages which indicates the proportion of these students who would be interested in various training clusters. Interest is expressed for fifteen program clusters which account for all possible vocational and technical education programs considered. These percentages are presented in Table 43. Appendix P contains the grouping scheme for programs versus interest clusters.

Number of Instructional Programs Needed to Meet Manpower Demand

The number of programs needed to meet manpower demand is determined by dividing the manpower demand for workers produced by a particular type of training program, by the number of graduates available for placement produced by a program of that type. If the result of this calculation is greater than the possible number of training sites, the number of training sites is substituted. For test number one, training sites have been limited to seventy-five. (Note: The number three was selected since there are three sites in the Central Kansas Area. Seventy-five was selected since there are seventy-five schools in Kansas with a student population large enough to support a variety of training programs. This information is presented in Tables 41 and 42, pages 497 and 500.

Table 43

Rank Ordering of Vocational-Technical Job
Clusters by Number of K-VIEW References

Programs	Rank	No. of References	Percent
Technicians N.E.C.	1	176	15.72
Clerical Workers	2.5	161	14.38
Medical Workers	2.5	161	14.38
Mechanics and Repairmen	4	116	10.36
Metal Craftsmen	5	97	8.66
Salesworkers	6	80	7.14
Service Workers N.E.C.	7	67	5.98
Construction Workers	8	58	5.18
Agricultural Workers	9	46	4.11
Drivers and Deliverymen	10	43	3.84
Textile Occupations	11	34	3.09
Food Service Workers	12	25	2.23
Protective Service Workers	13	24	2.14
Transportation and Public Utilities Workers N.E.C.	14	22	1.96
Printing Craftsmen	15	9	.83
Total		1,119	

Table 44

Subprofessional Annual Manpower Needs of the
Central Kansas Area and the State of
Kansas in Selected Occupations

Cluster of Training Programs	Cluster of Occupations	Annual Central Kansas Area Manpower Need	Annual Statewide Manpower Need
Production Ag	Farmers and Farm Workers	29	568
Ag Mechanics	Ag Mechanics & Other Related Mechanics	10	325
Horticulture & Other Ag Resources	Groundkeepers & Nursery Workers & Workers in Conservation of Natural Resources	12	691
Ag Sales & Service	Ag Sales Workers & Ag Service Workers	78	2007
Distributive Ed Sales & Service	Advertising Agents & Salesworkers, Finance & Credit Workers Manufacturing Salesmen Insurance Salesmen Service Station Attendants Real Estate Agents Other Sales Workers N.E.C.	177	2216
Transportation	Deliveryman, Cab	20	398
Dental Assistants	Dental Assistant	1	137
Dental Hygienist	Dental Hygienist	-2	73
Dental Lab Technician	Dental Lab Technician	-1	24

Table 44(continued)

Cluster of Training Programs	Cluster of Occupations	Annual Central Kansas Area Manpower Need	Annual Statewide Manpower Need
LPN Training	Licensed Practical Nurse	49	744
Medical Assistant	Medical Assistant		322
Medical Lab Assistant	Medical Lab Assistant	12	95
Medical Record Secretary	Medical Record Secretary Medical Record Clerk Ward Clerk	1	65
Child Care & Guidance	Teacher Aide Child Care Center Workers Private Household Child Care Workers	21	358
Clothing Mgmt. Prod. & Service	Laundry Workers Sewers & Stickers	31	554
Food Mgmt. Prod. & Service	Cooks, Waiters & Waitresses	149	2,853
Secretary/Steno	Secretary/Steno & Related	146	2,406
Accounting & Computing	Accounting Clerks Bookkeepers Bank Tellers Cashiers	83	1,563
Office Machine & Key Punch	Office Machine Operator Key Punch Operator	28	248
Data Processing	Computer Programmer Computer Operator	12	-9
Material Support	Shipping & Receiving Clerks	3	53
Communications	Telephone Operator	23	387
Typing & Other Clerical	Other Clerical	167	1,496

Table 44(continued)

Cluster of Training Programs	Cluster of Occupations	Annual Central Kansas Area Manpower Need	Annual Statewide Manpower Need
Civil Technology	Civil Technical Surveyor	6	159
Electronic Technology	Electronic Technician	3	111
Police Science	Police, Detective, Sheriff, Security Guard	14	351
Air Conditioning	Air Conditioning Mechanic	10	259
Appliance Repair	Appliance Repair	4	101
Auto Body	Auto Body Mechanics	3	19
Auto Mechanics	Auto Mechanics	16	223
Aviation Occupations	Airplane Mechanics	2	-77
Commercial Art	Commercial Artist	0	-6
Photography	Photographer	0	30
Carpentry	Carpenter, Roofer Cabinet Maker	54	339
Electricity	Electrician	10	135
Masonry	Brick, Stone, & Tile Setters Cement & Concrete Workers	8	51
Plumbing	Plumbers & Pipe Fitters	12	157
Diesel Mechanics	Railroad Mechanic Diesel Mechanic	5	134
Lineman	Lineman	8	170
Electronics Voc.	Electronic Mechanics Electronic Assemblers	10	301
Radio & TV	Radio & TV Mechanics	1	-29

Table 44 (continued)

Cluster of Training Programs	Cluster of Occupations	Annual Central Kansas Area Manpower Need	Annual Statewide Manpower Need
Graphic Arts	Printing Occupations	9	141
Welding	Welders	18	390
Machine Shop	Machinist Machine Tool Operator	23	238
Sheet Metal	Sheet Metal Workers	9	159
Cosmetology	Cosmetologists	30	-38
Small Engines	Small Engine Mechanics	2	63
Truck Driving	Truck Drivers	21	909
Heavy Equipment	Heavy Equipment Operator	12	137

COMPUTER PROCESSING

Coefficients for all equations, including the function to be optimized were coded using Coding Form LP-1 which is represented in Figure 20. Each equation required fifteen lines of coding. There were eight fields of nine digits each on a coding line. Zero coefficients were represented by blank fields. Non-zero coefficients were right justified. The B values were treated as coefficients and entered in the last field of the fifteenth coding line representing the equation. (Note: B equals zero for the equation to be optimized). Data from the LP-1 Coding Sheets were keypunched according to the card layout shown in Figure 21.

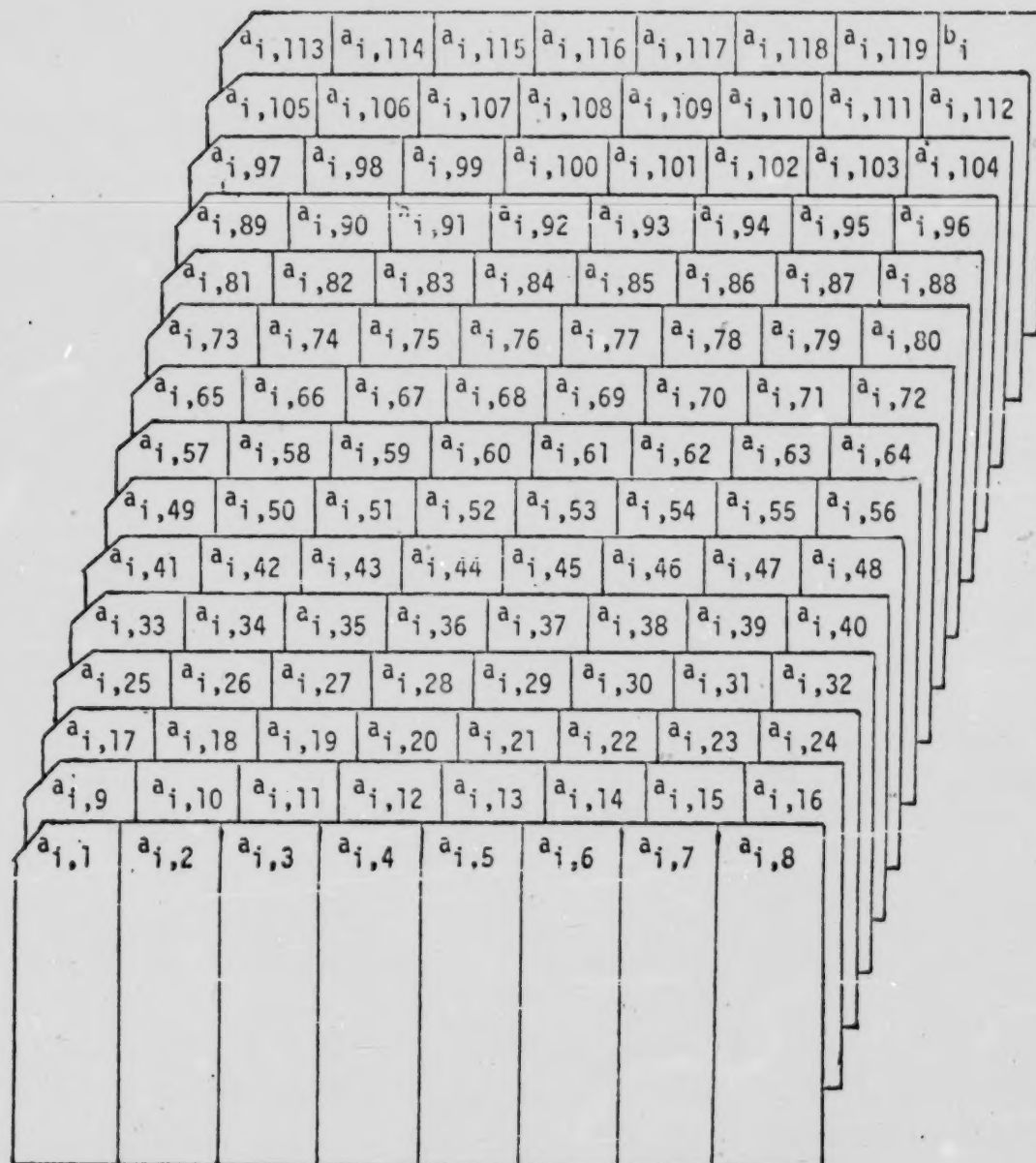
Any standard linear programming software can be used to support this system. However, in this study the software described in Mathematical Programming by Claude McMillan³ was selected for this module since it was readily available at the Kansas State University Computer Center. Modifications were made in this software to meet the requirements of IBM 360 50H hardware and an OS operating system. Data representing the equation to be optimized and the restricting equations was inserted into the software as shown in Figure 22. Flow charts and program listings are not presented here due to copyright laws.

A DISCUSSION OF RESULTS FROM THE DECISION MODEL APPLICATION TO THE CENTRAL KANSAS AREA VOCATIONAL TECHNICAL SCHOOL STUDENT SERVICE AREA

The model was applied to the data generated from the Central Kansas Area Vocational Technical School Service Area. Results show that to serve the student needs adequately in direct relationship to employment opportunities and limited resources available, the following changes should occur in the existing program mix.

New programs to be considered for development:

1. Accounting and Computing
2. Agriculture Mechanics
3. Agriculture Sales and Service
4. Air Conditioning
5. Appliance Repair



Field 1 = cc 1-9

Field 5 = cc 37-45

Field 2 = cc 10-18

Field 6 = cc 46-54

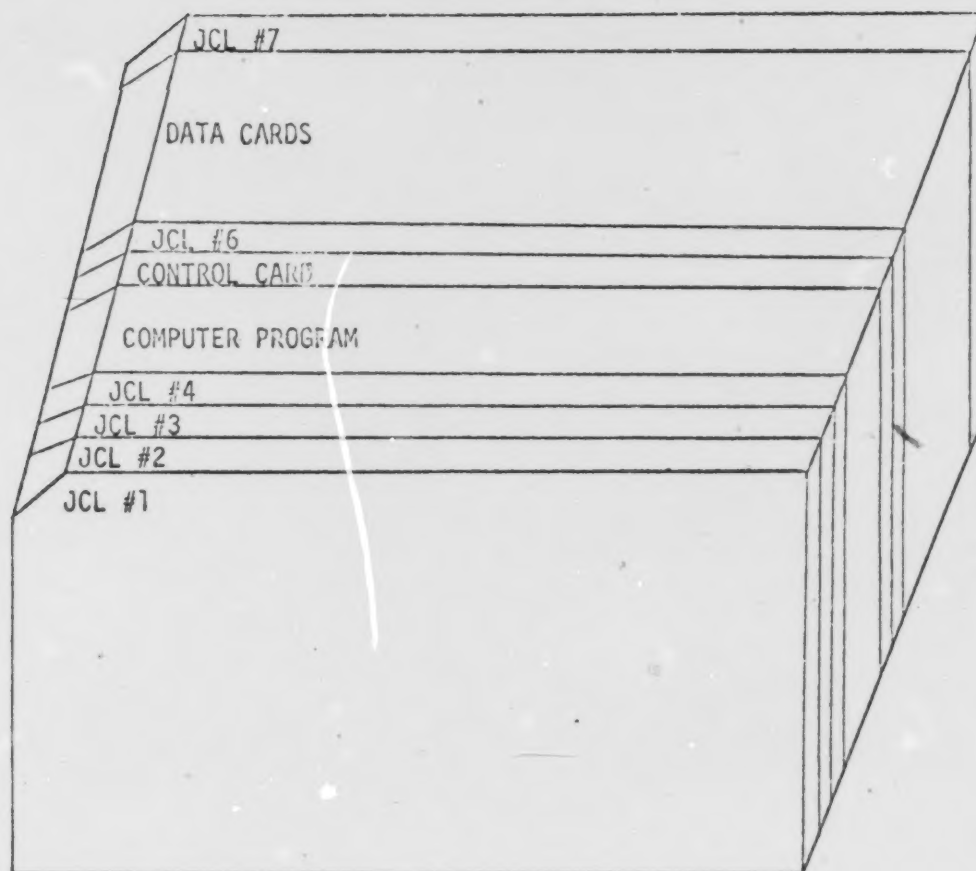
Field 3 = cc 19-27

Field 7 = cc 55-63

Field 4 = cc 28-36

Field 8 = cc 64-72

Figure 20. Card Layout for a Single Equation of the Linear Programming Model



```

JCL #1. //WATFIV . . JOB (XXXXXXXX,10),DEB,CLASS=A
JCL #2. // EXEC WATFIN
JCL #3. //GO.SYSIN DD *
JCL #4. $JOB
JCL #5. ....69...120....51
JCL #6. $ENTRY
JCL #7. $STOP

```

Figure 22. JCL Setup for Linear Programming Model

6. Child Care and Guidance
7. Civil Technology
8. Clothing, Management, Production, and Service
9. Communications
10. Cosmetology
11. Data Processing
12. Electronics Vocational
13. Masonry
14. Medical Assistant
15. Plumbing
16. Sheet Metal
17. Transportation

Existing programs to be considered for expansion:

1. Carpentry
2. Distributive Education, Sales and Service
3. Licensed Practical Nurse Training
4. Typing and Clerical

Existing programs that should be considered for reduction in trainee numbers:

1. Machine Shop
2. Production Agriculture

Existing programs that should be considered for closing:

1. Auto Mechanics
2. Drafting
3. Electricity
4. Electronics Technology
5. Graphic Arts
6. Horticulture and Agriculture Resources
7. Medical Record Secretary
8. Police Science
9. Radio and TV Mechanics

Programs that should not be considered for development:

1. Auto Body
2. Aviation Occupations
3. Commercial Art

4. Dental Assistant
5. Dental Hygienist
6. Dental Laboratory Technician
7. Diesel Mechanic
8. Heavy Equipment
9. Lineman
10. Material Support
11. Medical Laboratory Assistant
12. Photography
13. Small Engine
14. Truck Driving
15. Welding

Results are shown in detail in Table 45. Results further indicate that this program mix will place 612 students annually into employment, but will leave 249 needing training in various fields. This compares with the present mix that placed 525 in fiscal 1971-72.

APPLICATION OF THE DECISION MODEL TO THE STATE OF KANSAS

The 50 program model was applied to the state of Kansas with results compared to the existing mix. Table 46 presents the resulting information. The optimum program mix would place 11,898 trainees into the work force as compared to the 5,339* now being placed from the existing mix, and could be accomplished with the same level of funding expenditure.

Programs which the model indicated should be considered for development include:

1. Accounting and Computing
2. Material Support
3. Office Machines and Key Punch
4. Sheet Metal
5. Transportation

Programs which the model indicated should be considered for expansion include:

1. Agriculture Mechanics

Table 45

Proposed Vocational and Technical Educational Instructional
 Program Types the Central Kansas Area Vocational Technical
 School Program Mix and the Resulting Program Mix
 Concluded from the Decision Model Application

Programs	Number of Existing CKA VTS Instructional Programs	Number of Instructional Programs Projected by Model
Production Ag	3.5	2
Ag Mechanics	0	1
Horticulture and Ag Resources	1	0
Ag Sales and Service	0	3
Dist. Ed, Sales, and Service	2	2.5
Transportation	0	1
Dental Assistants	0	0
Dental Hygienist	0	0
Dental Lab Technician	0	0
LPN Training	2.5	3
Medical Assistant	0	2
Medical Lab Assistant	0	0
Medical Record Secretary	1	0
Child Care Guidance	0	3
Clothing Mgmt. Prod. and Service	0	3

Table 45 (continued)

Programs	Number of Existing CKAITS Instructional Programs	Number of Instructional Programs Projected by Model
Food Mgmt. Prod. and Service	0	3
Secretary/Steno	3	3
Accounting and Computing	0	3
Office Machine and Key Punch	0	.5
Data Processing	0	1
Material Support	0	0
Communications	0	1
Typing and Other Clerical	1	3
Civil Technology	0	1
Electronics Technology	2	0
Police Science	1	0
Air Conditioning	0	1
Appliance Repair	0	3
Auto Body	0	0
Auto Mechanics	4	0
Aviation Occupations	0	0
Commercial Art	0	0
Photography	0	0
Carpentry	2	3
Electricity	1	0
Masonry	0	1

Table 45 (continued)

Programs	Number of Existing CKAITS Instructional Programs	Number of Instructional Programs Projected by Model
Plumbing	0	1
Diesel Mech.	0	0
Drafting	1.5	0
Lineman	0	0
Electronics Voc.	0	1
Radio and TV Mech.	1	0
Graphic Arts	1	0
Welding	0	0
Machine Shop	3	1
Sheet Metal	0	1
Cosmetology	0	2
Small Engines	0	0
Truck Driving	0	0
Heavy Equipment	0	0

Table 46

Proposed Vocational and Technical Educational Instructional
Program Types--The Existing Program Mix for the State of
Kansas and the Resulting Program Mix Concluded from
the Decision Model Application

Programs	Number of Existing Instructional Programs for Kansas	Number of Instructional Programs Needed as Concluded from the Decision Model Application
Production Ag	201	50
Ag Mechanics	22	30
Horticulture and Ag Resources	4	5
Ag Sales and Service	6	75
Dist. Ed, Sales and Service	66	63
Transportation	0	23
Dental Assistants	7	1
Dental Hygienist	3	0
Dental Lab Technician	0	0
LPN Training	59	20
Medical Assistant	3	32
Medical Lab Assistant	2	6
Medical Record Secretary	3	5
Child Care and Guidance	4	36

Table 46 (continued)

Programs	Number of Existing Instructional Programs for Kansas	Number of Instructional Programs Needed as Concluded from the Decision Model Application
Clothing Mgmt. Prod. and Serv.	13	55
Food Mgmt. Prod. ans Serv.	6	72
Secretary/Steno	61	75
Accounting and Computing	0	67
Office Mach. and Key Punch	0	14
Data Processing	30	1
Material Support	0	3
Communications	2	15
Typing and Other Clerical	58	71
Civil Technology	2	11
Electronics Technology	16.5	4
Police Science	14	40
Air Conditioning	11	6
Appliance Repair	2	6
Auto Body	19	1
Auto Mechanics	67.5	4
Aviation Occupations	10	1
Commercial Art	3	1
Photography	1	2

Table 46 (continued)

Programs	Number of Existing Instructional Programs for Kansas	Number of Instructional Programs Needed as Concluded from the Decision Model Application
Carpentry	21.5	32
Electricity	13	7
Masonry	3	4
Plumbing	1	9
Diesel Mech.	7	7
Drafting	37	12
Lineman	3	6
Electronics Voc.	9	6
Radio and TV Mech.	2	2
Graphic Arts	28	10
Welding	27	20
Machine Shop	31.5	12
Sheet Metal	0	10
Cosmetology	12	1
Small Engines	1	2
Truck Driving	2	41
Heavy Equipment	4	5

2. Agriculture Sales and Service
3. Appliance Repair
4. Carpentry
5. Child Care and Guidance
6. Clothing Management, Production and Service
7. Civil Technology
8. Communications
9. Food Management
10. Heavy Equipment
11. Horticulture and Agriculture Resources
12. Lineman
13. Medical Assistant
14. Medical Lab Assistant
15. Medical Record Secretary
16. Photography
17. Plumbing
18. Police Science
19. Small Engine
20. Truck Driving
21. Typing and Other Clerical

Programs which the model indicated should be considered for reduction in number include:

1. Air Conditioning
2. Auto Body
3. Auto Mechanics
4. Aviation Occupations
5. Commercial Art
6. Cosmetology
7. Data Processing
8. Dental Assistant
9. Distributive Education Sales and Service
10. Electricity
11. Electronics Technology
12. Electronics Vocational
13. Graphic Arts

14. LPN Training
15. Machine Shop
16. Production Agriculture
17. Welding

Programs which the model indicated should be considered for closing include:

1. Dental Hygienist
2. Drafting

Programs which the model indicated should not be considered for development include:

1. Dental Lab Technician

Programs which the model indicated where no change in numbers should occur:

1. Diesel Mechanics
2. Radio and TV Mechanics

The program mix presented here optimizes placement and is restricted by the number of students to be served, money available (including cost per program), student interest and manpower needs.

The most restrictive parameters probably are manpower needs and cost per program while number of students probably had little influence as not all students could be served.

SUMMARY

A test of the decision model was made by applying the linear program to data collected from the Central Kansas Area Vocational Technical School Service Area and the State of Kansas. Data represented the following variables: (1) program cost, (2) available financial resources, (3) student interest, (4) number of instructional programs needed to meet manpower demand, (5) program student capacity, (6) program placement rates, (7) manpower needs, (8) number of students to be served, and (9) number of males and females to be served.

The data was processed, coded, and entered into an IBM 360 Computer System as directed by the model design. Results of the test indicated that of the fifty programs proposed, the Central Kansas Area Vocational Technical

School program mix might be modified to include seventeen new programs, four programs should be expanded, two programs should be reduced, nine programs should be closed, and fifteen programs should not be considered for development.

Results further indicated that of the fifty programs proposed, the State of Kansas program mix should include five new programs, twenty-one programs to be expanded, seventeen programs to be considered for reduction, two programs to be considered for closing, one program not to be considered for development, and two programs with no change.

Changes in the program mix would result in a significant increase in placement of students into employment representing areas of training. This increase would occur in the Central Kansas Area Vocational Technical School service area as well as the State of Kansas.

FOOTNOTES

¹ Kansas, Handbook for Vocational and Technical Education Planners, Cycle II Report (Manhattan, Kansas: Division of Vocational Education, 1973).

^a Ibid., p. 84.

² Ibid.

³ Claude McMillan. Mathematical Programming (New York: John Wiley and Sons, Inc., 1970), pp. 428-442.

^b The Central Kansas Area Vocational Technical School Annual Budget and Plan for Fixcal 1972-1973.

⁴ Kansas, State Department of Education, Form OE 3139, 1973.

Chapter 40

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the study, conclusions based upon the research findings, and recommendations based upon those finding.

SUMMARY

Research indicates that most school systems offering various vocational and technical education programs have selected those programs in a very subjective manner. As a matter of fact, writers in the area of program selection and evaluation note that most program selection has been done by vocational and technical education administrators who have based their judgments upon personal experience, authority, or tradition.

This dissertation represents an intensive effort to develop an objective method that could be used as a foundation upon which to base program selection decisions.

During the last several years considerable research effort has gone into developing techniques that identify work force needs, but little has been written that deals with the variables that should influence the design of the curriculum that is used to prepare students for work force entry.

M. G. Mudzo, of Oklahoma State University, 1970, has however, developed a model for identifying the needed work force entrants and the vocational and technical education system capability to produce individuals with the needed skills. Mudzo used a linear programming statistical technique to quantify the model. His example was followed as linear programming concerns itself with the efficient allocation of limited resources to meet desired objectives where solutions satisfy both the condition of the problem and the given objective in terms of the most optimum solution. The objective of this study was to determine an optimum program mix that could be administered within limited financial resources.

This study is in many ways an extension of the Mudzo research, however, in this study the problem has been approached from an educational

needs point of view taking into account several variables that effect vocational and technical education programming.

Variables that have been identified for manipulation in determining an optimal program mix for a specific vocational and technical education student service area are: the cost of each vocational and technical education program, total available vocational and technical education financial resources, the number of students interested in a particular program, the number of programs needed to meet manpower need, the number of students a particular program can serve, the total student population that will not complete higher education, and the number of students expected to be placed into employment for which they were trained.

A model was developed using data that quantitatively expressed the variables in a fashion that could be introduced into a linear programming design. Through data manipulation within the linear program which included the optimizing of a specific variable while constraining and minimizing others an optimum solution was determined. The solution is expressed as the program mix of various vocational and technical education programs that will place the most student program completors into the work force within the constraints established by the model.

CONCLUSIONS

This study established a procedure that will accurately determine an optimal vocational and technical program mix for a specific service area.

The model as developed is within the resource capability of most school systems and other governmental units of Kansas as it incorporates data available from state-wide sources in addition to local data that can be generated from budgets and student accounting systems. The variables used to develop model input data were identified and their interrelationships were defined and quantified within a degree of accuracy that should increase the probability of more effective decisions relating to vocational and technical education program planning. The model was shown to be adaptable to two geographical areas--a local school service area and a state-side application to Kansas.

Differences in the findings of the two model applications may be attributed to the fact that the Central Kansas Area is not a mini-model of the state, but has unique characteristics which include manpower demand, student population, and available funds.

RECOMMENDATIONS

The following recommendations would add to the sophistication of the decision-making process in vocational and technical education planning.

1. The decision-making model developed in this study should be applied by both state and local vocational and technical education planners as an objective method of making program-planning decisions.
2. An investigation should be conducted to determine what additional parameters could be optimized when considering changes in the vocational and technical program mix.
3. Further research should be conducted to investigate, through linear programming analysis, the actual total cost of developing sufficient trainees in vocational and technical education for all entry-level work force job opportunities existing within the state.

In the past, one of the greatest problems faced by vocational and technical education planners has been the lack of objective decision-making tools. However, these techniques must be applied to achieve planning objectivity. The application of quantitative evaluation techniques to vocational and technical education planning is relatively new and complex.

Part 9

HANDBOOK FOR VOCATIONAL AND TECHNICAL EDUCATION
PLANNERS - CYCLE II: JANUARY 1973

Robert E. Scott,
James L. Harris,
R. B. Daniels,
Wilber Rawson,

and

The K-MUST Staff

Chapter 41

INTRODUCTION

BACKGROUND

One of the major problems facing the occupational education planner is the lack of documented information for use as a basis in the decision making process. In some instances, the data needed for planning is available but a communication gap exists between the data producer and the data user. In other instances, the data needed for planning is available but must be analyzed further in light of the user's needs. In still other instances, new data must be generated through research techniques.

What is universally required across the nation is a continuous and systematic approach to providing occupational education planners data that they need when they need it. The approach must be flexible so that it can provide a wide variety of information and yet must be structured in a manner such that operating costs would be in some reasonable balance with the benefits derived from the information produced.

The state of Kansas has officially recognized the need for planning data. The Division of Vocational Education of the State Department of Education has contracted with Kansas State University for the development of a system to produce planning data.

Specific types of information which have been requested include: (1) the demand for and supply of various types of workers and an interfacing of the data to indicate where discrepancies between the two exist, (2) a rank ordering of vocational and occupational clusters in terms of student interest, (3) data reflecting the need for upgrading training of workers presently in the labor force, and (4) data identifying potential student populations and where these populations are located.

PURPOSES

The purposes of this document are to provide data on projected manpower supply and demand, and interface the data in such a way as to estimate future discrepancies between these two factors. In addition, the document will provide data on the need for upgrading training, data on student interest relative to various occupational clusters, and data on potential student populations across the state of Kansas.

SCOPE

The data in this document is directed toward the need of the occupational education planner and hence is concerned with sub-professional manpower exclusively.

This is the second cycle report of the K-MUST system and many improvements suggested by users of the first cycle report have been implemented. Manpower demand and supply data has been regionalized and the interfacing has been modified to better fit the types of training found in Kansas. Data on upgrading training needs has been collected from Kansas employers and replaces national factors used in last year's report. Additional 1970 census data is available and has been used to improve the potential student population figures. Finally, the limited student interest data used last year has been expanded to include over 1,000 references from the K-VIEW system.

PHILOSOPHY

The philosophical base on which this system has been established can be summed in one word, "usefulness." The system will concentrate on the needs of users. Input from users will be used to terminate, initiate or redirect activities of the system staff.

Every effort will be made to make the system responsive to changing needs and special requests for data. Flexibility within the limits of cost parameters will be built into operational procedures.

In recognition of the fact that management information systems provide data and planners make decisions, every effort will be made to

consult with planners about recommendations prior to any publication of information. In addition, all limitations and assumptions affecting the validity of data will be explained fully in hopes that users will temper their decisions in light of these restrictions.

It is recognized that projections are subject to error and hence, if and when better information becomes available, it will be utilized fully.

In light of cost parameters, every relevant and available data source will be utilized before extending efforts to collect original data. In addition, data collection, processing and analysis techniques will be designed with the cost factor in mind.

Chapter 42

NET SUBPROFESSIONAL MANPOWER NEEDS IN KANSAS

BACKGROUND

To meet the requirements set forth in the 1968 Amendments to the 1963 Vocational Education Act, the objective of vocational training must be entry level employment for graduates. One of the many considerations involved in planning training to meet this objective is the types of employment that will be available in the future.

Two types of data are needed for projections of net manpower needs (the types of jobs that will be available in the future), i.e., future manpower demand and future manpower supply. Neither of these data sets alone is acceptable for planning.

Manpower demand projections should be considered to be "best possible estimates" in light of an assumed economic situation. The manpower demand projections utilized in this report are based on present economic trends in the state of Kansas. If a major shift should occur in the Kansas situation, planners should adjust the data accordingly.

Although manpower supply can be controlled to some extent through manipulation of program offerings, projections are usually based on the assumption that present trends will continue during the projection period. The planner can then adjust program offerings in a manner that will decrease discrepancies between manpower supply and manpower demand.

PURPOSE

The purpose of this chapter is to present an interfacing of projected manpower demand and projected manpower supply in such a way that potential discrepancies between future demand and supply are identified.

LIMITATIONS

Research indicates that accuracy increases as the size of the manpower demand estimates increases. Statewide estimates of manpower demand should, therefore, be considerably more accurate than regional estimates.

Supply estimates are directly related to present manpower training program production. Changes such as decreases in dropout rates, increases in placement rates and increases in enrollment will affect the accuracy of supply figures.

MAJOR ASSUMPTIONS

1. Manpower demand trends will continue in a somewhat similar pattern to that which has existed since 1960.

2. Manpower supply will be similar to that supply that has been available in the past few years. The planner can adjust supply from this base and these adjustments will be reflected in the next cycle report.

PROCEDURES

Manpower Demand Estimates: The manpower demand estimates presented in this report were derived using the Modified Bureau of Labor Statistics Matrix Techniques developed at Kansas State University. This technique is based on a procedure used nationally which was modified to fit the Kansas economy. The adjustments in the national technique reflect economic trends identified by the Kansas Employment Security Commission.

Manpower Supply Estimates: In all cases, manpower supply was estimated using the past record of manpower production of various programs or organizations. The total number of graduates from training programs was factored in terms of past records of graduate follow-up to reflect the number of graduates actually entering the labor market.

Interfacing: The interfacing of occupations and training programs was modified in conjunction with state administrators of vocational and technical education. It was not possible to incorporate all modifications due to limited resources. Restructuring the interfacing often resulted in

increased demand for training. This restructuring was based on the nature of Kansas' vocational and technical curricula.

Regionalization: Manpower demand and supply data is presented for the eleven planning and development regions in Kansas and the state as a whole. Figure 23 depicts the regions which were established by the Kansas Department of Economic Development.

FIGURE 23 REGIONAL MAP OF KANSAS

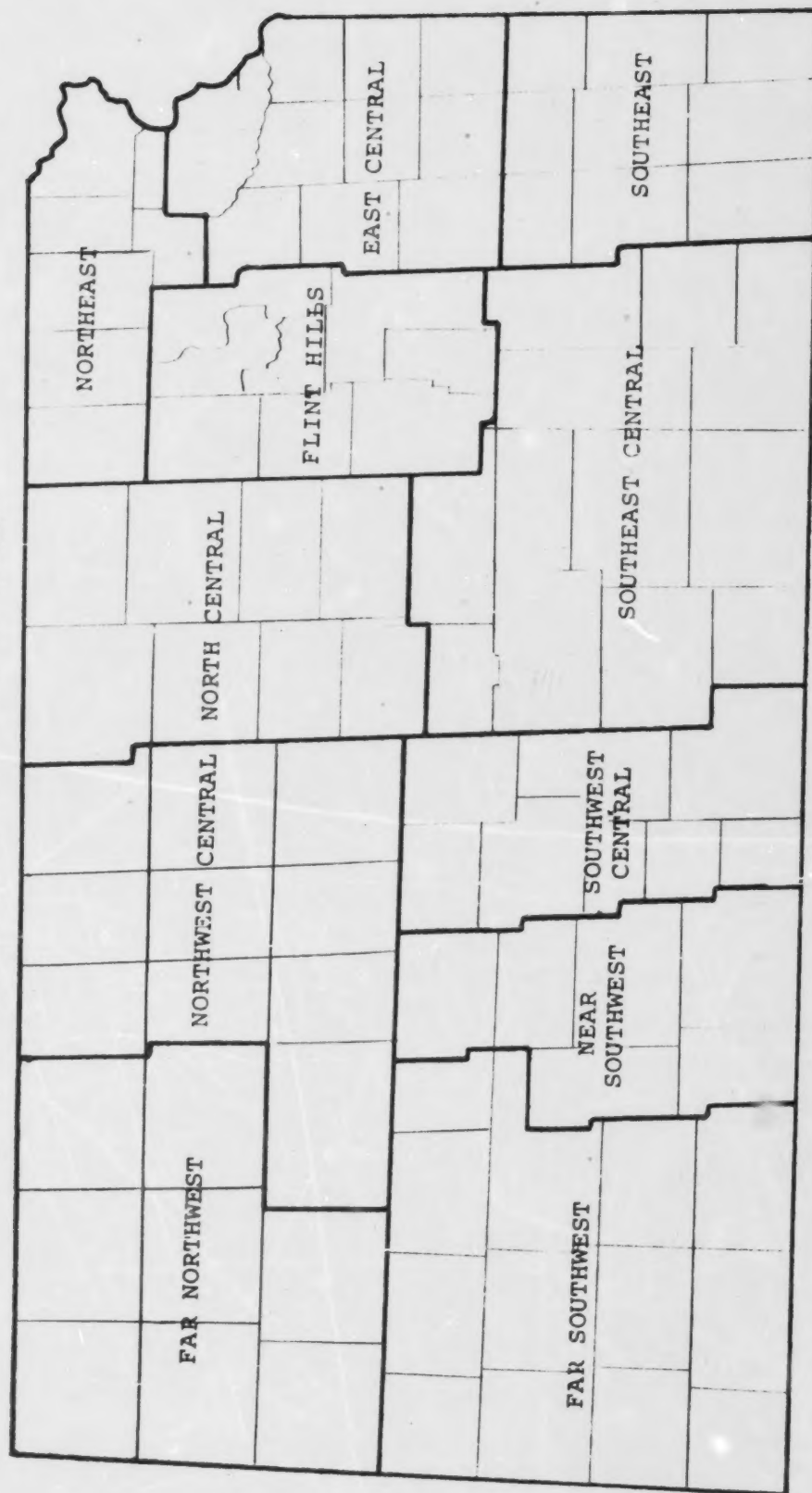


TABLE 47
NET SUBPROFESSIONAL MANPOWER NEEDS IN KANSAS
1972-1976

STATEWIDE TOTALS

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS						PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING	BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
FARMER & FARM WKRS	2271	1731	186		463	257			(366)	PRODUCTION AG
AG MECHANICS OTHER RELATED MECHANICS	546 754									
TOTAL	1300	957 957	31 31			99 99			213	AG MECHANICS
GROUNDKEEPERS & NURSERY WKRS	789	164	44		49	85			447	HORTICULTURE
AG SALES WKRS AG SERVICE WKRS AG PROCESSING WKRS	2490 5537 4565									
TOTAL	12592	155 90 245	45 45		14 15 29	511 511			11763	AG SALES & SERVICE AG PRODUCTS
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	272									
TOTAL	272	81 53 134	10 10		7 7	52 52			69	AG RESOURCES AG FORESTRY
ADVERTISING AGENTS & SALESWORKERS	93	132	56		23				(118)	ADVERTISING
FINANCE & CREDIT WORKERS	77	12	10		2				53	FINANCE & CREDIT
MANUFACTURING SALESMEN	1106	8	23		3				1072	INDUSTRIAL
INSURANCE SALESMEN	1133	6	4		1				1122	INSURANCE
SERVICE STATION ATTENDANTS	674	8	12		3				651	PETROLEUM
REAL ESTATE AGENT	309	12			2			175	120	REAL ESTATE

TABLE 47 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN KANSAS
1972-1976

STATEWIDE TOTALS:

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
OTHER SALESWORKER N. E. C.	10359	251 115 41 342 197 827 66 22 12 91	81 12 10 56 4 399 106 38 20		44 16 6 51 27 160 23 8 1 13		244 1250 		

TABLE 47 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN KANSAS
1972-1976

STATEWIDE TOTALS

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
REGISTERED NURSE	4674						1584 766			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	4674		292				2350		2032	
TEACHER AIDE CHILD CARE CENTER WORKERS PVT HOUSEHOLD CHILD CARE WKRS	305 559 566									CHILD CARE & GUIDANCE
TOTAL	1430	100							1330	
LAUNDRY WORKERS SEWERS & STICHERS	1239 977						109			CLOTHING MANAGEMENT PRODUCTION & SERVICES
TOTAL	2216	115					109		1992	
COOKS WAITERS & WAITRESSES FOUNTAIN WORKERS BARTENDERS	4744 5208 1236 223						214			FOOD MANAGEMENT, PRODUCTION & SERVICES
TOTAL	11411	540					214		10657	
STENO/SECRETARY & RELATED	14264	773	420	118		2457		2183	8309	SECRETARY/STENO
ACCOUNTING CLERKS BOOKKEEPERS BANK TELLERS CASHIERS	1276 2475 327 4202									ACCOUNTING & COMPUTING
TOTAL	8780	95	58	140		3217	140	548	4582	

TABLE 47 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN KANSAS
1972-1976

STATEWIDE TOTALS

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DETAILED ENTERIES					
OFFICE MACHINE OP KEYPUNCH OP	1675 419			274				1103		OFFICE MACHINES & KEYPUNCH
TOTAL	2094			274				1103	717	
COMPUTER PROGRAM- MER COMPUTER OP	799 451									
TOTAL	1240	87 87	595 595	360 360		32 32		1275 1275	(1109)	DATA PROCESSING
SHIPPING & RECEIV- ING CLKS	213	10	41						162	MATERIAL SUPPORT
TELEPHONE OP	1547	23							1524	COMMUNICATIONS
PERSONNEL CLKS	353	3	23						327	PERSONNEL
MANAGER/SUPERVISOR	15283					8201		123	6959	SUPERVISION
OTHER CLERICAL	16977	964	133	411		9486	821	688	4474	TYPING & OTHER CLERICAL N. E. C.
CIVIL TECHNICIAN SURVEYOR	526 110									
TOTAL	636	18 18	16 16						602	CIVIL TECHNOLOGY
ELECTRONICS TECH	444	10	172					118	144	ELECTRONICS TECH
POLICE, DETECTIVE, SHERIFF SECURITY GUARD	859 545									
TOTAL	1404		329 329						1075	POLICE SCIENCE
AIR CONDITIONING MECHANIC	1115	106	334	444			78		153	AIR CONDITIONING
APPLIANCE REPAIR- MAN	502	24	14	113			98		253	APPLIANCE REPAIR
AUTO BODY MECH	169	121	415	388			80	13	(848)	AUTO BODY

TABLE 47 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN KANSAS
1972-1976

STATEWIDE TOTALS

STATEWIDE TOTALS										
CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	998	1470	1287	454			397	180	(2790)	AUTO MECHANICS
AIRPLANE MECHANIC	76	75	417	186				385	(987)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	113						1	18	94	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	71	15	47					88	(79)	COMMERCIAL ART
PHOTOGRAPHER	122	12	13	50					47	PHOTOGRAPHY
CARPENTER ROOFER	1293 64									CARPENTRY
TOTAL	1357	478	222	25			82 82		550	
ELECTRICIAN	580	85	284	89			40		82	ELECTRICITY
PAINTER PLASTERER	602 25						14 14			PAINTING
TOTAL	627								613	
BRICK, STONE & TILE SETTERS	197									MASONRY
CEMENT & CONCRETE WORKERS	140						101 101			
TOTAL	337	5 5							231	
PLUMBERS & PIPE- FITTERS	671			42			43		586	PLUMBING
JANITORS & SEXTONS CHARWOMEN	4803 1202									CUSTODIAL SERVICES
TOTAL	6005						296 296		5709	
RAILROAD MECHANIC DIESEL MECHANIC	38 498									DIESEL MECHANIC
TOTAL	536	40 40	286 286						210	

TABLE 47 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN KANSAS
1972-1976

STATEWIDE TOTALS

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL — TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMAN	399	173	364	107				135	(380)	DRAFTING
LINEMAN	741		55				67		619	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	398 808									
TOTAL	1206	204 204	374 374	166 166					462	ELECTRONICS (VOC)
FOREMEN	2778								2778	FOREMANSHIP
RADIO & TV MECH	81	24	26	35			195		(199)	RADIO & TV
PRINTING OCCUPA- TIONS	592	434	281	116			27		(266)	GRAPHIC ARTS
WELDERS	1743	426	621	681	76		183		(244)	WELDING
MACHINISTS MACHINE TOOL OP	746 206									
TOTAL	952	330 330	545 545	578 578			15 15		(516)	MACHINE SHOP
SHEET METAL WKRS	670	42	51	30			34		513	SHEET METAL
COSMETOLOGISTS	2513	12	325					2665	(489)	COSMETOLOGY
SMALL ENGINE MECH	251	90	88	228					(155)	SMALL ENGINES
CABINETMAKERS	128	48	41	85				22	(68)	CABINETMAKING
TRUCK DRIVERS	3624		59						3625	TRUCK DRIVING
UPHOLSTERERS	109						15		94	UPHOLSTERING
EVACUATING & GRADING MACHINE OPERATORS	548		85						463	HEAVY EQUIPMENT

TABLE 48
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
EAST CENTRAL REGION OF KANSAS: 1972-1976

EAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
FARMER & FARM WKRS	332	189	10		48	82		3	PRODUCTION AG
AG MECHANICS	96								
OTHER RELATED MECHANICS	376								
TOTAL	472	235				32		205	AG MECHANICS
		235				32			
GROUNDSCKEEPEPS & NURSERY WKRS	270	68	27		24	27		124	HORTICULTURE
AG SALES WKRS	946								
AG SERVICE WKRS	2069								
AG PROCESSING WKRS	1851								
		6			1	164			AG SALES & SERVICE
		38	10		10				AG PRODUCTS
TOTAL	4866	44	10		11	164		4637	
WORKERS IN CONSERVATION & MANAGEMENT OF NATURAL RESOURCES	80								
						16			AG RESOURCES
		20	10		6				AG FORESTRY
TOTAL	80	20	10		6	16		28	
ADVERTISING AGENTS & SALESWORKERS	35	39	10		6			(20)	ADVERTISING
FINANCE & CREDIT WORKERS	30	4	2		1			23	FINANCE & CREDIT
MANUFACTURING SALESMEN	420	3	4		1			412	INDUSTRIAL
INSURANCE SALESMEN	430	2	1					427	INSURANCE
SERVICE STATION ATTENDANTS	277	3	2		1			271	PETROLEUM
REAL ESTATE AGENT	117	4			1			112	REAL ESTATE

TABLE 48 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
EAST CENTRAL REGION OF KANSAS: 1972-1976

EAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS				PRIVATE SCHOOLS				
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING	BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OTHER SALESWORKER N. E. C.	3935	72 33 33 98 59 238 19 6 4 26	14 2 2 10 1 71 19 7 4		11 5 5 14 8 40 6 2 4			38 1250	APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM	
TOTAL	3935	588	130		95			1288	1834	
DELIVERYMEN, CAB	539	4	1		1				533	TRANSPORTATION
DENTAL ASSISTANT	224								224	DENTAL ASSISTANT
DENTAL HYGIENIST	93		77						16	DENTAL HYGIENIST
DENTAL LAB TECH	38						2		36	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	1411		456						955	LPN TRAINING
MEDICAL ASSISTANT	509								509	MEDICAL ASSISTANT
MEDICAL LAB ASST.	122								122	MEDICAL LAB ASST.
MEDICAL SECRETARY MEDICAL RECORD CLERK WARD CLERK	24 28 95		44					25		MEDICAL RECORD SECRETARY
TOTAL	147		44					25	78	
NURSE AIDE	3053	34	226						2793	NURSE AIDE

TABLE 48 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
EAST CENTRAL REGION OF KANSAS: 1972-1976

EAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
REGISTERED NURSE	2049					505 244			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE	
TOTAL	2049		148			749		1152		
TEACHER AIDE	101								CHILD CARE & GUIDANCE	
CHILD CARE CENTER WORKERS	252									
PVT HOUSEHOLD CHILD CARE WKRS	180	25								
TOTAL	533	25						508		
LAUNDRY WORKERS	528								CLOTHING MANAGEMENT PRODUCTION & SERVICES	
SEWERS & STICHERS	421	23								
TOTAL	949	23						926		
COOKS	1595								FOOD MANAGEMENT, PRODUCTION & SERVICES	
WAITERS & WAITRESSES	1841									
FOUNTAIN WORKERS	401						97			
BARTENDERS	85	135								
TOTAL	3922	135					97	3690		
STENO/SECRETARY & RELATED	5250	180	138	93		748		450	SECRETARY/STENO	
ACCOUNTING CLERKS	491								ACCOUNTING & COMPUTING	
BOOKKEEPERS	927									
BANK TELLERS	332									
CASHIERS	1490	61	9	50		1024	140	150		
TOTAL	3240	61	9	50		1024	140	150	1806	

TABLE 48 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
EAST CENTRAL REGION OF KANSAS: 1972-1976

EAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OFFICE MACHINE OP KEYPUNCH OP	679 170			105				420	OFFICE MACHINES & KEYPUNCH	
TOTAL	849			105				420		324
COMPUTER PROGRAM- MER COMPUTER OP	367 101								DATA PROCESSING	
TOTAL	468	45 45	304 304	205 205		32 32		280 280		(398)
SHIPPING & RECEIV- ING CLKS	106	7							99	MATERIAL SUPPORT
TELEPHONE OP	623	15							608	COMMUNICATIONS
PERSONNEL CLKS	179								179	PERSONNEL
MANAGER/SUPERVISOR	6327					2616			3711	SUPERVISION
OTHER CLERICAL	6329	372		112		3020	575	250	2000	TYPING & OTHER CLERICAL N.E.C.
CIVIL TECHNICIAN SURVEYOR	212 55								249	CIVIL TECHNOLOGY
TOTAL	267	8 8	10 10							
ELECTRONICS TECH	168								168	ELECTRONICS TECH
POLICE, DETECTIVE, SHERIFF SECURITY GUARD	290 215								310	POLICE SCIENCE
TOTAL	505		195 195							
AIR CONDITIONING MECHANIC	353						78		275	AIR CONDITIONING
APPLIANCE REPAIR- MAN	189	24	14	113					38	APPLIANCE REPAIR
AUTO BODY MECH	69	54	45	124			79		(233)	AUTO BODY

TABLE 48 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
EAST CENTRAL REGION OF KANSAS: 1972-1976

EAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
AUTO MECHANIC	408	397	78	145			241		(453)	AUTO MECHANICS
AIRPLANE MECHANIC	(42)							385	(427)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	44						1		43	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	29								29	COMMERCIAL ART
PHOTOGRAPHER	48	12	13	50					(27)	PHOTOGRAPHY
CARPENTER ROOFER	793 34									CARPENTRY
		97		8			24			
TOTAL	827	97		8			24		698	
ELECTRICIAN	236	38		28			14		156	ELECTRICITY
PAINTER PLASTERER	306 12									PAINTING
							1			
TOTAL	318								317	
BRICK, STONE & TILE SETTERS	100									MASONRY
CEMENT & CONCRETE WORKERS	66									
TOTAL	166						40 40		126	
PLUMBERS & PIPE- FITTERS	288			13			17		258	PLUMBING
JANITORS & SEXTONS CHARWOMEN	1591 427									CUSTODIAL SERVICES
							296 296			
TOTAL	2018								1722	
RAILROAD MECHANIC DIESEL MECHANIC	38 198									DIESEL MECHANICS
TOTAL	236								236	

TABLE 48 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
EAST CENTRAL REGION OF KANSAS: 1972-1976

EAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS 1972-1976	MANPOWER SUPPLY							MANPOWER NEEDS 1972-1976	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		IN TECHNICAL SCHOOLS	IN BUSINESS SCHOOLS	ADULT PREPARATORY	OPENED ENTERES					
DRAFTSMEN	179	25	60	35				25	34	DRAFTING
LINEMEN	398						67		331	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	151 310									ELECTRONICS (VOC)
TOTAL	461	19 19	31 31	53 53					358	
FOREMEN	1148								1148	FOREMANSHIP
RADIO & TV MECH	49	24	18	23			195		(211)	RADIO & TV
PRINTING OCCUPA- TIONS	276	11	91	37					137	GRAPHIC ARTS
WELDERS	696	111	72	216	18		140		139	WELDING
MACHINISTS MACHINE TOOL OP	287 80									MACHINE SHOP
TOTAL	367	12 12	17 17	184 184			5 5		149	
SHEET METAL WKRS	212						22		190	SHEET METAL
COSMETOLOGISTS	784	12	32					1137	(397)	COSMETOLOGY
SMALL ENGINE MECH	94	35	27	76					(44)	SMALL ENGINES
CABINETMAKERS	58						11		47	CABINETMAKING
TRUCK DRIVERS	1430								1430	TRUCK DRIVING
UPHOLSTERERS	47								47	UPHOLSTERING
VACUATING & GRADING MACHINE OPERATORS	273								273	HEAVY EQUIPMENT

TABLE 49
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST REGION OF KANSAS: 1972-1976

SOUTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
FARMER & FARM WKRS	221	363			87	24		(253)	PRODUCTION AG
AG MECHANICS	51								
OTHER RELATED MECHANICS	58								
TOTAL	109	101				9		(1)	AG MECHANICS
GROUNDKEEPERS & NURSERY WKRS	68					8		60	HORTICULTURE
AG SALES WKRS	209								
AG SERVICE WKRS	418								
AG PROCESSING WKRS	408								
TOTAL	1035	20				48		957	AG SALES & SERVICE AG PRODUCTS
WORKERS IN CONSERVATION & MANAGEMENT OF NATURAL RESOURCES	25								
TOTAL	25					5		20	AG RESOURCES AG FORESTRY
ADVERTISING AGENTS & SALESWORKERS	8	4	18		3			(17)	ADVERTISING
FINANCE & CREDIT WORKERS	6		3					3	FINANCE & CREDIT
MANUFACTURING SALESMEN	93		8		1			84	INDUSTRIAL
INSURANCE SALESMEN	95		2					93	INSURANCE
SERVICE STATION ATTENDANTS	40		5		1			34	PETROLEUM
REAL ESTATE AGENT	26							26	REAL ESTATE

TABLE 49 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST REGION OF KANSAS: 1972-1975

SOUTHEAST REGION

CLUSTER OF OCCUPATIONS	TOTAL MANPOWER NEEDS	MANPOWER SUPPLY						TOTAL MANPOWER NEEDS	CLUSTER OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					SCHOOL OF APPRENTICESHIP, FEDERAL DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST-SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
OTHER SALESWORKER N. E. C.	872	8 4 11 6 28 2 1 3	28 5 3 18 2 132 35 12 8		5 1 4 1 21 5 2 1			526	APPAREL & ACCESSORIES AUTOMOBILE FLORISTS FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM
TOTAL	872	63	243		40			526	
DELIVERYMEN, CAB	126		2					124	TRANSPORTATION
DENTAL ASSISTANT	63							63	DENTAL ASSISTANT
DENTAL HYGIENIST	26							26	DENTAL HYGIENIST
DENTAL LAB TECH	7							7	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	128		146					(18)	LPN TRAINING
MEDICAL ASSISTANT	144							144	MEDICAL ASSISTANT
MEDICAL LAB ASST.	34		24					10	MEDICAL LAB ASST.
MEDICAL SECRETARY MEDICAL RECORD CLERK WARD CLERK	7 8 18								MEDICAL RECORD SECRETARY
TOTAL	33							33	
NURSE AIDE	296	10	66					220	NURSE AIDE

TABLE 49 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST REGION OF KANSAS: 1972-1976

SOUTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
REGISTERED NURSE	270					147 71			DIPLOMA NURSE BACCALAUREATE NURS ASSOCIATE DEGREE NURSE	
TOTAL	270		29			218		23		
TEACHER AIDE	23									
CHILD CARE CENTER WORKERS	35									
PVT HOUSEHOLD CHILD CARE WKRS	53								CHILD CARE & GUIDANCE	
TOTAL	111							111		
LAUNDRY WORKERS	83									
SEWERS & STICHERS	98	23							CLOTHING MANAGEMEN PRODUCTION & SERVICES	
TOTAL	181	23						158		
COOKS	389									
WAITERS & WAITRESSES	420									
FOUNTAIN WORKERS	103									
BARTENDERS	18	135							FOOD MANAGEMENT, PRODUCTION & SERVICES	
TOTAL	930	135						795		
STENO/SECRETARY & RELATED	1122	21	64			233		804	SECRETARY/STENO	
ACCOUNTING CLERKS	97									
BOOKKEEPERS	204									
BANK TELLEPS	64									
CASHIERS	355		18			299			ACCOUNTING & COMPUTING	
TOTAL	720		18			299		403		

TABLE 49 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST REGION OF KANSAS: 1972-1976

SOUTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OFFICE MACHINE OP KEYPUNCH OP	118 29			8						OFFICE MACHINES & KEYPUNCH
TOTAL	147			8					139	
COMPUTER PROGRAM- MER	76									DATA PROCESSING
COMPUTER OP	21			15						
TOTAL	97			15					82	
SHIPPING & RECEIV- ING CLKS	21								21	MATERIAL SUPPORT
TELEPHONE OP	108								108	COMMUNICATIONS
PERSONNEL CLKS	14		15						(1)	PERSONNEL
MANAGER/SUPERVISOR	1121					760			361	SUPERVISION
OTHER CLERICAL	1308	18	37			881			372	TYPING & OTHER CLERICAL N.E.C.
CIVIL TECHNICIAN SURVEYOR	32 6									CIVIL TECHNOLOGY
TOTAL	38		10 10						28	
ELECTRONICS TECH	43								43	ELECTRONICS TECH
POLICE, DETECTIVE, SHERIFF	71									POLICE SCIENCE
SECURITY GUARD	39									
TOTAL	110								110	
AIR CONDITIONING MECHANIC	105			74					31	AIR CONDITIONING
APPLIANCE REPAIR- MAN	44								44	APPLIANCE REPAIR
AUTO BODY MECH	12	16	50	35					(89)	AUTO BODY

TABLE 49 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST REGION OF KANSAS: 1972-1976

SOUTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS						PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING	BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	71	161	35	42					(167)	AUTO MECHANICS
AIRPLANE MECHANIC	(27)								(27)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	8								8	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	5								5	COMMERCIAL ART
PHOTOGRAPHER	9								9	PHOTOGRAPHY
CARPENTER ROOFER	83									CARPENTRY
TOTAL	85			2	2		5	5	78	
ELECTRICIAN	33		50	8				6	(31)	ELECTRICITY
PAINTER PLASTERER	22									PAINTING
TOTAL	24						4	4	20	
BRICK, STONE & TILE SETTERS	10									MASONRY
CEMENT & CONCRETE WORKERS	6							2		
TOTAL	16						2	2	14	
PLUMBERS & PIPE- FITTERS	47			4				3	40	PLUMBING
JANITORS & SEXTONS CHARWOMEN	401 93									CUSTODIAL SERVICES
TOTAL	494								494	
RAILROAD MECHANIC DIESEL MECHANIC	0 48									DIESEL MECHANICS
TOTAL	48								48	

TABLE 49 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST REGION OF KANSAS: 1972-1976

SOUTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMEN	33	25	86	10					(88)	DRAFTING
LINEMEN	49								49	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	35 74									
TOTAL	109	110 110	79 79	15 15					(95)	ELECTRONICS (VOC)
FOREMEN	250								250	FOREMANSHIP
RADIO & TV MECH	2								2	RADIO & TV
PRINTING OCCUPA- TIONS	59	106		11					(58)	GRAPHIC ARTS
WELDERS	168	30	38	63	7				30	WELDING
MACHINISTS MACHINE TOOL OP	83 17									
TOTAL	100	78 78	153 153	54 54			2 2		(187)	MACHINE SHOP
SHEET METAL WKRS	41								41	SHEET METAL
COSMETOLOGISTS	216		212					320	(316)	COSMETOLOGY
SMALL ENGINE MECH	22								22	SMALL ENGINES
CABINETMAKERS	12		41	19					(48)	CABINETMAKING
TRUCK DRIVERS	371								371	TRUCK DRIVING
UPHOLSTERERS	9								9	UPHOLSTERING
VACUATING & GRADING MACHINE OPERATORS	26								26	HEAVY EQUIPMENT

TABLE 50
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FLINT HILLS REGION OF KANSAS: 1972-1976

FLINT HILLS REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
FARMER & FARM WKRS	240	230			55	19		(64)	PRODUCTION AG
AG MECHANICS	64								
OTHER RELATED MECHANICS	36								
TOTAL	100	169	16			7		(92)	AG MECHANICS
		169	16			7			
GROUNDKEEPERS & NURSERY WKRS	78	40			10	6		22	HORTICULTURE
AG SALES WKRS	182								
AG SERVICE WKRS	510								
AG PROCESSING WKRS	312								
		10			2	38			AG SALES & SERVICE
		8			2				AG PRODUCTS
TOTAL	1004	18			4	38		944	
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	23								
		39				4			AG RESOURCES
		9							AG FORESTRY
TOTAL	23	48				4		(29)	
ADVERTISING AGENTS & SALESWORKERS	7	2	5			1		(1)	ADVERTISING
FINANCE & CREDIT WORKERS	6		1					5	FINANCE & CREDIT
MANUFACTURING SALESMEN	81		2					79	INDUSTRIAL
INSURANCE SALESMEN	83							83	INSURANCE
SERVICE STATION ATTENDANTS	59		1					58	PETROLEUM
REAL ESTATE AGENT	23							23	REAL ESTATE

TABLE 50 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FLINT HILLS REGION OF KANSAS: 1972-1976

FLINT HILLS REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS				PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING	BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
OTHER SALESWORKER N. E. C.	754	4 2 5 3 13 1	7 1 1 5 34 9 3		1 1 6 1				APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM
TOTAL	754	29	61		9			655	
DELIVERYMEN, CAB	134	1						133	TRANSPORTATION
DENTAL ASSISTANT	49	5	43					1	DENTAL ASSISTANT
DENTAL HYGIENIST	20							20	DENTAL HYGIENIST
DENTAL LAB TECH	6							6	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	150		249					(99)	LPN TRAINING
MEDICAL ASSISTANT	112							112	MEDICAL ASSISTANT
MEDICAL LAB ASST.	27							27	MEDICAL LAB ASST.
MEDICAL SECRETARY	5								MEDICAL RECORD SECRETARY
MEDICAL RECORD CLERK	6								
RECORD CLERK	14								
TOTAL	25							25	
NURSE AIDE	371	8	52					311	NURSE AIDE

TABLE 50 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FLINT HILLS REGION OF KANSAS: 1972-1976

FLINT HILLS REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
REGISTERED NURSE	281					116 56			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	281					172		109	
TEACHER AIDE	36								CHILD CARE & GUIDANCE
CHILD CARE CENTER WORKERS	54								
PVT HOUSEHOLD CHILD CARE WKRS	41								
TOTAL	131							131	
LAUNDRY WORKERS	108								CLOTHING MANAGEMENT, PRODUCTION & SERVICES
SEWERS & STITCHERS	43								
TOTAL	151							151	
COOKS	457								FOOD MANAGEMENT, PRODUCTION & SERVICES
WAITERS & WAITRESSES	474								
FOUNTAIN WORKERS	118								
BARTENDERS	21								
TOTAL	1070							1070	
STENO/SECRETARY & RELATED	1249	116				183		950	SECRETARY/STENO
ACCOUNTING CLERKS	124								ACCOUNTING & COMPUTING
BOOKKEEPERS	190								
BANK TELLERS	57								
CASHIERS	342	5		25		234			
TOTAL	713	5		25		234		449	

TABLE 50 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FLINT HILLS REGION OF KANSAS: 1972-1976

FLINT HILLS REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF COLLECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OFFICE OP KEYPUNCH OP	168 42			105					OFFICE MACHINES & KEYPUNCH	
TOTAL	210			105				105		
COMPUTER PROGRAM- MER	88								DATA PROCESSING	
COMPUTER OP	25		81							
TOTAL	113		81					32		
SHIPPING & RECEIV- ING CLKS	13							13	MATERIAL SUPPORT	
TELEPHONE OP	139							139	COMMUNICATIONS	
PERSONNEL CLKS	56							56	PERSONNEL	
MANAGER/SUPERVISOR	1348					597		751	SUPERVISION	
OTHER CLERICAL	1521	8		100		691		722	TYPING & OTHER CLERICAL N.E.C.	
CIVIL TECHNICIAN SURVEYOR	35 6								CIVIL TECHNOLOGY	
TOTAL	41							41		
ELECTRONICS TECH	32							32	ELECTRONICS TECH	
POLICE, DETECTIVE, SHERIFF	109								POLICE SCIENCE	
SECURITY GUARD	64									
TOTAL	173							173		
AIR CONDITIONING MECHANIC	96		81	74				(59)	AIR CONDITIONING	
APPLIANCE REPAIR- MAN	40							40	APPLIANCE REPAIR	
AUTO BODY MECH	16			28			1	(13)	AUTO BODY	

TABLE 50 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS OF THE
FLINT HILLS REGION OF KANSAS: 1972-1976

FLINT HILLS REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS	PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	96	71	109	33					(117)	AUTO MECHANICS
AIRPLANE MECHANIC	0								0	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	3								3	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	5								5	COMMERCIAL ART
PHOTOGRAPHER	9								9	PHOTOGRAPHY
CARPENTER ROOFER	40 4									CARPENTRY
TOTAL	44	23 23	16 16	2 2			21 21		(18)	
ELECTRICIAN	35		54	6					(25)	ELECTRICITY
PAINTER PLASTERER	42 2									PAINTING
TOTAL	44						5 5		39	
BRICK, STONE & TILE SETTERS	13									MASONRY
CEMENT & CONCRETE WORKERS	8						9 9		12	
TOTAL	21						9 9		12	
PLUMBERS & PIPE- FITTERS	46			3					43	PLUMBING
JANITORS & SEXTONS CHARWOMEN	459 95									CUSTODIAL SERVICES
TOTAL	554								554	
RAILROAD MECHANIC DIESEL MECHANIC	0 0									DIESEL MECHANICS
TOTAL	0								0	

TABLE 50 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FLINT HILLS REGION OF KANSAS: 1972-1976

FLINT HILLS REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS	PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL								NON-VOCATIONAL PUBLIC TRAINING
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMEN	26		20	8				(2)	DRAFTING	
LINEMEN	58		55					3	LINEMAN	
ELECTRONIC MECH ELECTRONIC ASSEMBLER	32 65								ELECTRONICS (VOC)	
TOTAL	97	12 12	26 26	12 12				47		
FOREMEN	196							196	FOREMANSHIP	
RADIO & TV MECH	12							12	RADIO & TV	
PRINTING OCCUPA- TIONS	58	56	38	8				(44)	GRAPHIC ARTS	
WELDERS	115	18	17	51				29	WELDING	
MACHINISTS MACHINE TOOL OP	66 16								MACHINE SHOP	
TOTAL	82	15 15	13 13	42 42				12 12		
SHEET METAL WKPS	35							35	SHEET METAL	
COSMETOLOGISTS	176						249	(73)	COSMETOLOGY	
SMALL ENGINE MECH	20	35	38	76				(129)	SMALL ENGINES	
CABINETMAKERS	7			38				(31)	CABINETMAKING	
TRUCK DRIVERS	282							282	TRUCK DRIVING	
UPHOLSTERERS	7							7	UPHOLSTERING	
EVACUATING & GRADING MACHINE OPERATORS	40							40	HEAVY EQUIPMENT	

TABLE 51
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHEAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
FARMER & FARM WKRS	384	194	3		47	70		70	PRODUCTION AG	
AG MECHANICS	80									
OTHER RELATED MECHANICS	240									
TOTAL	320	103	6			27		184	AG MECHANICS	
		103	6			27				
GROUNDKEEPERS & NURSERY WKRS	207	12	17		5	23		150	HORTICULTURE	
AG SALES WKRS	640									
AG SERVICE WKRS	1460									
AG PROCESSING WKRS	1181		35			138			AG SALES & SERVICE AG PRODUCTS	
TOTAL	3281		35			138		3108		
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	76									
						14			AG RESOURCES AG FORESTRY	
TOTAL	76					14		62		
ADVERTISING AGENTS & SALESWORKERS	24	55	10		8			(49)	ADVERTISING	
FINANCE & CREDIT WORKERS	20	5	2		1			12	FINANCE & CREDIT	
MANUFACTURING SALESMEN	284	4	4		1			275	INDUSTRIAL	
INSURANCE SALESMEN	291	4	1		1			285	INSURANCE	
SERVICE STATION ATTENDANTS	172	4	2		1			165	PETIOLEUM	
REAL ESTATE AGENT	79	5			1		175	(102)	REAL ESTATE	

TABLE 51 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHEAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DEVELOPED ENTITIES				
OTHER SALESWORKER N. E. C.	2660	106 48 5 144 82 350 28 9 5 38	14 2 2 10 1 71 19 7 4		16 7 1 20 11 55 6 2 1 5		168	APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM	
TOTAL	2660	815	130		124		168	1423	
DELIVERYMEN, CAB	360	5	1		1			353	TRANSPORTATION
DENTAL ASSISTANT	189	8	56				150	(25)	DENTAL ASSISTANT
DENTAL HYGIENIST	78		57					21	DENTAL HYGIENIST
DENTAL LAB TECH	26							26	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	872		572					300	LPN TRAINING
MEDICAL ASSISTANT	430						300	130	MEDICAL ASSISTANT
MEDICAL LAB ASST.	103							103	MEDICAL LAB ASST.
MEDICAL SECRETARY	21								
MEDICAL RECORD CLERK	23								
HAPD CLERK	55		56				2		MEDICAL RECORD SECRETARY
TOTAL	99		56				2	35	
NURSE AIDE	1796	29	193					1574	NURSE AIDE

TABLE 51 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHEAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
REGISTERED NURSE	1259					430 208			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE	
TOTAL	1259		49			638		572		
TEACHER AIDE	71								CHILD CARE & GUIDANCE	
CHILD CARE CENTER WORKERS	106									
PVT HOUSEHOLD CHILD CARE WKRS	154	25								
TOTAL	331	25						306		
LAUNDRY WORKERS	323								CLOTHING MANAGEMENT, PRODUCTION & SERVICES	
SEWERS & STICHERS	257	46					109			
TOTAL	580	46					109	425		
COOKS	1204								FOOD MANAGEMENT, PRODUCTION & SERVICES	
WAITERS & WAITRESSES	1318									
FOUNTAIN WORKERS	315						117			
BARTENDERS	55						117			
TOTAL	2892						117	2775		
STENO/SECRETARY & RELATED	3777	341	74	25		679		865	1793	SECRETARY/STENO
ACCOUNTING CLERKS	320									ACCOUNTING & COMPUTING
BOOKKEEPERS	622									
BANK TELLERS	236									
CASHIERS	1096	25	9	40		872	398			
TOTAL	2274	25	9	40		872	398	930		

TABLE 51 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHEAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS	PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRERS					
OFFICE MACHINE OP KEYPUNCH OP	437 110			28				683		OFFICE MACHINES & KEYPUNCH
TOTAL	548			28				683	(163)	
COMPUTER PROGRAM- MER COMPUTER OP	69 248									
TOTAL	317	38 38	101 101	140 140				870 870	(832)	DATA PROCESSING
SHIPPING & RECEIV- ING CLKS	48	3							45	MATERIAL SUPPORT
TELEPHONE OP	392	8							384	COMMUNICATIONS
PERSONNEL CLKS	79	3							76	PERSONNEL
MANAGER/SUPERVISOR	3866					2219		85	1562	SUPERVISION
OTHER CLERICAL	4282	364	27	113		2570	246	438	524	TYPING & OTHER CLERICAL N.E.C.
CIVIL TECHNICIAN SURVEYOR	143 25									
TOTAL	168								168	CIVIL TECHNOLOGY
ELECTRONICS TECH	127	10	140					118	(141)	ELECTRONICS TECH
POLICE, DETECTIVE, SHERIFF SECURITY GUARD	210 133									
TOTAL	343		75 75						268	POLICE SCIENCE
AIR CONDITIONING MECHANIC	307	49	144	148					(34)	AIR CONDITIONING
APPLIANCE REPAIR- MAN	128						98		30	APPLIANCE REPAIR
AUTO BODY MECH	37	35	135	105				13	(251)	AUTO BODY

TABLE 51: (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHEAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	220	654	281	123			156	180	(1174)	AUTO MECHANICS
AIRPLANE MECHANIC	193	75	307	178					(367)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	45							18	27	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	17							88	(71)	COMMERCIAL ART
PHOTOGRAPHER	29								29	PHOTOGRAPHY
CARPENTER ROOFER	301 13									CARPENTRY
TOTAL	314	201	61	7			30 30		15	
ELECTRICIAN	198	41	40	24			17		76	ELECTRICITY
PAINTER PLASTERER	140 6									PAINTING
TOTAL	146						4 4		142	
BRICK, STONE & TILE SETTERS	41									MASONRY
CEMENT & CONCRETE WORKERS	33									
TOTAL	74						33 33		41	
PLUMBERS & PIPE- FITTERS	179			11			22		146	PLUMBING
JANITORS & SEXTONS CHARWOMEN	1222 327									CUSTODIAL SERVICES
TOTAL	1549								1549	
RAILROAD MECHANIC DIESEL MECHANIC	0 141									DIESEL MECHANICS
TOTAL	141								141	

TABLE 51 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHEAST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHEAST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMEN	118	117	94	30				110	(233)	DRAFTING
LINEMEN	133								133	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	102 208									
TOTAL	310	52 52	70 70	45 45					143	ELECTRONICS (VOC)
FOREMEN	729								729	FOREMANSHIP
RADIO & TV MECH	15								15	RADIO & TV
PRINTING OCCUPA- TIONS	96	244	61	31			27		(267)	GRAPHIC ARTS
WELDERS	452	135	196	185	33		43		(140)	WELDING
MACHINISTS MACHINE TOOL OP	162 52									
TOTAL	214	186	132	157			8		(269)	MACHINE SHOP
SHEET METAL WKRS	295	33	51	30			10		171	SHEET METAL
COSMETOLOGISTS	649							959	(310)	COSMETOLOGY
SMALL ENGINE MECH	64	20	23	76					(55)	SMALL ENGINES
CABINETMAKERS	31	48		28					(45)	CABINETMAKING
TRUCK DRIVERS	861								861	TRUCK DRIVING
UPHOLSTERERS	25						15		10	UPHOLSTERING
EVACUATING & GRADING MACHINE OPERATORS	121								121	HEAVY EQUIPMENT

TABLE 52
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHWEST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
FARMER & FARM WKRS	156	43			11	10		92	PRODUCTION AG
AG MECHANICS OTHER RELATED MECHANICS	30 8								
TOTAL	38	51 51				4 4		(17)	AG MECHANICS
GRUNDSKEEPEES & NURSERY WKRS	30	4			1	3		22	HORTICULTURE
AG SALES WKRS AG SERVICE WKRS AG PROCESSING WKRS	70 190 98								
TOTAL	358	12 12				21 21		325	AG SALES & SERVICE AG PRODUCTS
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	11								
TOTAL	11	3 3				2 2		6	AG RESOURCES AG FORESTRY
ADVERTISING AGENTS & SALESWORKERS	3	3						0	ADVERTISING
FINANCE & CREDIT WORKERS	2							2	FINANCE & CREDIT
MANUFACTURING SALESMEN	31							31	INDUSTRIAL
INSURANCE SALESMEN	32							32	INSURANCE
SERVICE STATION ATTENDANTS	11							11	PETROLEUM
REAL ESTATE AGENT	9							9	REAL ESTATE

TABLE 52 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHWEST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OTHER SALESWORKER N. E. C.	291	6 3 9 5 21 2 1 2			1 1 3				APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM	
TOTAL	291	49			6			236		
DELIVERYMEN, CAB	53							53	TRANSPORTATION	
DENTAL ASSISTANT	28							28	DENTAL ASSISTANT	
DENTAL HYGIENIST	13							13	DENTAL HYGIENIST	
DENTAL LAB TECH	3							3	DENTAL LAB TECH	
LICENSED PRACTICAL NURSE	77							77	LPN TRAINING	
MEDICAL ASSISTANT	64							64	MEDICAL ASSISTANT	
MEDICAL LAB ASST.	15							15	MEDICAL LAB ASST.	
MEDICAL SECRETARY MEDICAL RECORD CLERK WARD CLERK	3 3 8								MEDICAL RECORD SECRETARY	
TOTAL	14							14		
NURSE AIDE	177	4	28					145	NURSE AIDE	

TABLE 52 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHWEST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
						BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
REGISTERED NURSE	140					63 31			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	140		33			94		13	
TEACHER AIDE	10								
CHILD CARE CENTER WORKERS	15								
PVT HOUSEHOLD CHILD CARE WKRS	23	25							CHILD CARE & GUIDANCE
TOTAL	48	25						23	
LAUNDRY WORKERS	42								
SEWERS & STICHERS	22								CLOTHING MANAGEMENT, PRODUCTION & SERVICES
TOTAL	64							64	
COOKS	171								
WAITERS & WAITRESSES	174								
FOUNTAIN WORKEPS	47								
BARTENDERS	6								FOOD MANAGEMENT, PRODUCTION & SERVICES
TOTAL	398							398	
STENO/SECRETARY & RELATED	463	9	58			102		294	SECRETARY/STENO
ACCOUNTING CLERKS	36								
BOOKKEEPERS	75								
BANK TELLERS	22								
CASHIERS	142		4			131			ACCOUNTING & COMPUTING
TOTAL	275		4			131		140	

TABLE 52 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHWEST CENTRAL REGION OF KANSAS: 1972-1976

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SOUTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
OFFICE MACHINE OP KEYPUNCH OP	46 12								OFFICE MACHINES & KEYPUNCH
TOTAL	58							58	
COMPUTER PROGRAM- MER COMPUTER OP	31 9								DATA PROCESSING
TOTAL	40		24 24					16	
SHIPPING & RECEIV- ING CLKS	3							3	MATERIAL SUPPORT
TELEPHONE OP	44							44	COMMUNICATIONS
PERSONNEL CLKS	6							6	PERSONNEL
MANAGER/SUPERVISOR	268					333		35	SUPERVISION
OTHER CLERICAL	530		7	63		385		75	TYPING & OTHER CLERICAL N.E.C.
CIVIL TECHNICIAN SURVEYOR	11 2								CIVIL TECHNOLOGY
TOTAL	13							13	
ELECTRONICS TECH	6							6	ELECTRONICS TECH
POLICE, DETECTIVE SHERIFF SECURITY GUARD	29 16								POLICE SCIENCE
TOTAL	45		20 20					25	
AIR CONDITIONING MECHANIC	35							35	AIR CONDITIONING
APPLIANCE REPAIR- MAN	14							14	APPLIANCE REPAIR
AUTO BODY MECH	4			16				(12)	AUTO BODY

TABLE 52 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHWEST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	22		66	18					(62)	AUTO MECHANICS
AIRPLANE MECHANIC	(15)								(15)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	2								2	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	2								2	COMMERCIAL ART
PHOTOGRAPHER	4								4	PHOTOGRAPHY
CARPENTER ROOFER	(7) 0			1						CARPENTRY
TOTAL	(7)			1					(8)	
ELECTRICIAN	6			4					2	ELECTRICITY
PAINTER PLASTERER	6 0									PAINTING
TOTAL	6								6	
BRICK, STONE & TILE SETTERS	2									MASONRY
CEMENT & CONCRETE WORKERS	2									
TOTAL	4								4	
PLUMBERS & PIPE- FITTERS	13			2					11	PLUMBING
JANITORS & SEXTONS CHARWOMEN	178 42									CUSTODIAL SERVICES
TOTAL	220								220	
RAILROAD MECHANIC DIESEL MECHANIC	0 16									DIESEL MECHANICS
TOTAL	16								16	

TABLE 52 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
SOUTHWEST CENTRAL REGION OF KANSAS: 1972-1976

SOUTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS				PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL							
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
DRAFTSMEN	4		6	4				(6)	DRAFTING
LINEMEN	(1)							(1)	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	12 16			7					ELECTRONICS (VOC)
TOTAL	28			7				21	
FOREMEN	55							55	FOREMANSHIP
RADIO & TV MECH	0							0	RADIO & TV
PRINTING OCCUPA- TIONS	14		30	5				(21)	GRAPHIC ARTS
WELDERS	40		64	27	6			(57)	WELDING
MACHINISTS MACHINE TOOL OP	23 6								MACHINE SHOP
TOTAL	29		140 140	23 23				(134)	
SHEET METAL WKRS	9							9	SHEET METAL
COSMETOLOGISTS	98							98	COSMETOLOGY
SMALL ENGINE MECH	7							7	SMALL ENGINES
CABINETMAKERS	3							3	CABINETMAKING
TRUCK DRIVERS	86							86	TRUCK DRIVING
UPHOLSTERERS	3							3	UPHOLSTERING
VACUATING & GRADING MACHINE OPERATORS	9							9	HEAVY EQUIPMENT

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TABLE 53
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NEAR SOUTHWEST REGION OF KANSAS: 1972-1976

NEAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
FARMER & FARM WKRS	90	41	19		15	5		10	PRODUCTION AG	
AG MECHANICS OTHER RELATED MECHANICS	20 3									
TOTAL	23	20 20	3 3			2 2		(2)	AG MECHANICS	
GROUNDKEEPERS & NURSERY WKRS	16					2		14	HORTICULTURE	
AG SALES WKRS AG SERVICE WKRS AG PROCESSING WKRS	52 104 75									
TOTAL	231	4 3 7				6 6		218	AG SALES & SERVICE AG PRODUCTS	
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	6									
TOTAL	6	7 9 16				1 1		(11)	AG RESOURCES AG FORESTRY	
ADVERTISING AGENTS & SALESWORKERS	2	7	6		2			(13)	ADVERTISING	
FINANCE & CREDIT WORKERS	1	1	1					(1)	FINANCE & CREDIT	
MANUFACTURING SALESMEN	23		2					21	INDUSTRIAL	
INSURANCE SALESMEN	23							23	INSURANCE	
SERVICE STATION ATTENDANTS	13		1					12	PETROLEUM	
REAL ESTATE AGENT	6	1						5	REAL ESTATE	

TABLE 53 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NEAR SOUTHWEST REGION OF KANSAS: 1972-1976

NEAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS				
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING					
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES						
OTHER SALESWORKER N. E. C.	215	13 6 1 17 10 41 3 1 1 5	8 1 1 6 41 11 4 2		3 1 2 1 11 2 1 1					APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM	
TOTAL	215	98	74		22				21		
DELIVERYMEN, CAB	36	1	2						33	TRANSPORTATION	
DENTAL ASSISTANT	14								14	DENTAL ASSISTANT	
DENTAL HYGIENIST	6								6	DENTAL HYGIENIST	
DENTAL LAB TECH	2								2	DENTAL LAB TECH	
LICENSED PRACTICAL NURSE	39		133						(94)	LPN TRAINING	
MEDICAL ASSISTANT	32								32	MEDICAL ASSISTANT	
MEDICAL LAB ASST.	8								8	MEDICAL LAB ASST.	
MEDICAL SECRETARY	2										
MEDICAL RECORD CLERK	2										
HARD CLERK	4										
TOTAL	8								8	MEDICAL RECORD SECRETARY	
NURSE AIDE	92	2	14						76	NURSE AIDE	

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TABLE 53 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NEAR SOUTHWEST REGION OF KANSAS: 1972-1976

NEAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
REGISTERED NURSE	75					32 15			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	75					47		28	
TEACHER AIDE	7								CHILD CARE & GUIDANCE
CHILD CARE CENTER WORKERS	11								
PVT HOUSEHOLD CHILD CARE WKRS	11	25							
TOTAL	29	25						4	
LAUNDRY WORKERS	26								CLOTHING MANAGEMENT, PRODUCTION & SERVICES
SEWERS & STICHERS	12	23							
TOTAL	38	23						15	
COOKS	95								FOOD MANAGEMENT, PRODUCTION & SERVICES
WAITERS & WAITRESSES	99								
FOUNTAIN WORKERS	26	135							
BARTENDERS	4								
TOTAL	224	135						89	
STENO/SECRETARY & RELATED	256	70				50		136	SECRETARY/STENO
ACCOUNTING CLERKS	22								ACCOUNTING & COMPUTING
BOOKKEEPERS	49								
BANK TELLERS	15					65			
CASHIERS	84								
TOTAL	170					65		105	

TABLE 53 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NEAR SOUTHWEST REGION OF KANSAS: 1972-1976

NEAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
OFFICE MACHINE OP KEYPUNCH OP	25 6									
TOTAL	31								31	OFFICE MACHINES & KEYPUNCH
COMPUTER PROGRAM- MER	18									
COMPUTER OP	5									
TOTAL	13								13	DATA PROCESSING
SHIPPING & RECEIV- ING CLKS	2								2	MATERIAL SUPPORT
TELEPHONE OP	27								27	COMMUNICATIONS
PERSONNEL CLKS	2								2	PERSONNEL
MANAGER/SUPERVISOR	259					164			95	SUPERVISION
OTHER CLERICAL	313	20				190			103	TYPING & OTHER CLERICAL N.E.C.
CIVIL TECHNICIAN SURVEYOR	16 1									
TOTAL	17								17	CIVIL TECHNOLOGY
ELECTRONICS TECH	21								21	ELECTRONICS TECH
POLICE, DETECTIVE, SHERIFF	17									
SECURITY GUARD	8									
TOTAL	25								25	POLICE SCIENCE
AIR CONDITIONING MECHANIC	22								22	AIR CONDITIONING
APPLIANCE REPAIR- MAN	9								9	APPLIANCE REPAIR
AUTO BODY MECH	4			8					(4)	AUTO BODY

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TABLE 53 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NEAR SOUTHWEST REGION OF KANSAS: 1972-1976

NEAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	21	31	109	9				(128)	AUTO MECHANICS	
AIRPLANE MECHANIC	(7)							(7)	AVIATION OCCUPATION	
OFFICE MACHINE MECHANIC	2							2	BUSINESS MACHINE REPAIR	
COMMERCIAL ARTIST	1							1	COMMERCIAL ART	
PHOTOGRAPHER	2							2	PHOTOGRAPHY	
CARPENTER ROOFER	1 1								CARPENTRY	
TOTAL	2	110 110	16 16	1 1				(125)		
ELECTRICIAN	5	3	43	2				(43)	ELECTRICITY	
PAINTER PLASTERER	6 0								PAINTING	
TOTAL	6							6		
BRICK, STONE & TILE SETTERS	2								MASONRY	
CEMENT & CONCRETE WORKERS	2									
TOTAL	4							4		
PLUMBERS & PIPE- FITTERS	8			1				7	PLUMBING	
JANITORS & SEXTONS CHARWOMEN	98 23								CUSTODIAL SERVICES	
TOTAL	121							121		
RAILROAD MECHANIC DIESEL MECHANIC	0 10								DIESEL MECHANICS	
TOTAL	10							10		

TABLE 53 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NEAR SOUTHWEST REGION OF KANSAS: 1972-1976

NEAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMEN	4			2				2	DRAFTING	
LINEMEN	8							8	LINEMAN	
ELECTRONIC MECH ELECTRONIC ASSEMBLER	3 6									
TOTAL	9			3 3				6	ELECTRONICS (VOC)	
FOREMEN	43							43	FOREMANSHIP	
RADIO & TV MECH	0		8	12				(20)	RADIO & TV	
PRINTING OCCUPA- TIONS	10			2				8	GRAPHIC ARTS	
WELDERS	31	48	34	14	8			(73)	WELDING	
MACHINISTS MACHINE TOOL OP	16 4									
TOTAL	20	24 24	34 34	12 12				(50)	MACHINE SHOP	
SHEET METAL WKRS	6	9						(3)	SHEET METAL	
COSMETOLOGISTS	48		95					(47)	COSMETOLOGY	
SMALL ENGINE MECH	5							5	SMALL ENGINE	
CABINETMAKERS	2							2	CABINETMAKING	
TRUCK DRIVERS	59		59					0	TRUCK DRIVING	
UPHOLSTERERS	2							2	UPHOLSTERING	
EVACUATING & GRADING MACHINE OPEFATORS	6							6	HEAVY EQUIPMENT	

TABLE 54
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR SOUTHWEST REGION OF KANSAS: 1972-1976

FAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
FARMER & FARM WKRS	149	86	109		47	9		(102)	PRODUCTION AG
AG MECHANICS	40								AG MECHANICS
OTHER RELATED MECHANICS	4								
TOTAL	44	57				3		(16)	
GROUNDKEEPERS & NURSERY WKRS	31	4				3		24	HORTICULTURE
AG SALES WKRS	96								AG SALES & SERVICE AG FORESTRY
AG SERVICE WKRS	179								
AG PPROCESSING WKRS	144	2				18			
TOTAL	419	57				18		394	
WORKERS IN CONSERVATION & MANAGEMENT OF NATURAL RESOURCES	10								AG RESOURCES AG FORESTRY
		9				2			
TOTAL	10	9				2		(1)	
ADVERTISING AGENTS & SALESWORKERS	4	5			1			(2)	ADVERTISING
FINANCE & CREDIT WORKERS	3	1						2	FINANCE & CREDIT
MANUFACTURING SALESMEN	42							42	INDUSTRIAL
INSURANCE SALESMEN	44							44	INSURANCE
SERVICE STATION ATTENDANTS	38							38	PETROLEUM
REAL ESTATE AGENT	12	1						11	REAL ESTATE

TABLE 54 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR SOUTHWEST REGION OF KANSAS: 1972-1976

FAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OTHER SALESWORKER N. E. C.	398	10			1				APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM	
		5			1					
		1								
		14			2					
		8			1					
		33			4					
		3								
		1								
		1								
		4			1					
TOTAL	398	80			10			308		
DELIVERYMEN, CAB	71	1						70	TRANSPORTATION	
DENTAL ASSISTANT	24							24	DENTAL ASSISTANT	
DENTAL HYGIENIST	10							10	DENTAL HYGIENIST	
DENTAL LAB TECH	3							3	DENTAL LAB TECH	
LICENSED PRACTICAL NURSE	42							42	LPN TRAINING	
MEDICAL ASSISTANT	54		32					22	MEDICAL ASSISTANT	
MEDICAL LAB ASST.	13							13	MEDICAL LAB ASST.	
MEDICAL SECRETARY	3								MEDICAL RECORD SECRETARY	
MEDICAL RECORD CLERK	3									
WARD CLERK	7									
TOTAL	13							13		
NURSE AIDE	106	4	24					78	NURSE AIDE	

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TABLE 54 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR SOUTHWEST REGION OF KANSAS: 1972-1976

FAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
REGISTERED NURSE	102					54 26			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE	
TOTAL	102		33			80		(11)		
TEACHERS AIDE	16								CHILD CARE & GUIDANCE	
CHILD CARE CENTER WORKERS	24									
PVT HOUSEHOLD CHILD CARE WKRS	19									
TOTAL	59							59		
LAUNDRY WORKERS	20								CLOTHING MANAGEMENT, PRODUCTION & SERVICES	
SEWERS & STICHERS	36									
TOTAL	56							56		
COOKS	193								FOOD MANAGEMENT, PRODUCTION & SERVICES	
WAITERS & WAITRESSES	199									
FOUNTAIN WORKERS	52									
BARTENDERS	8									
TOTAL	452							452		
STENO/SECRETARY & RELATED	454	21	48			86		299	SECRETARY/STENO	
ACCOUNTING CLERKS	45								ACCOUNTING & COMPUTING	
BOOKKEEPERS	95									
BANK TELLERS	20									
CASHIERS	149	2				110				
TOTAL	309	2				110		197		

TABLE 54 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR SOUTHWEST REGION OF KANSAS: 1972-1976

FAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS				PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL			NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY					
OFFICE MACHINE OP KEYPUNCH OP	42 10			28					OFFICE MACHINES & KEYPUNCH
TOTAL	52			28				24	
COMPUTER PROGRAM- MER	32								
COMPUTER OP	9	4	16						DATA PROCESSING
TOTAL	41	4	16					21	
SHIPPING & RECEIV- ING CLKS	5							5	MATERIAL SUPPORT
TELEPHONE OP	46							46	COMMUNICATIONS
PERSONNEL CLKS	2		8					(6)	PERSONNEL
MANAGER/SUPERVISOR	485					281		204	SUPERVISION
OTHER CLERICAL	595	26	7			325		237	TYPING & OTHER CLERICAL N.E.C.
CIVIL TECHNICIAN SURVEYOR	16 3								
TOTAL	19							19	CIVIL TECHNOLOGY
ELECTRONICS TECH	7		10					(3)	ELECTRONICS TECH
POLICE, DETECTIVE, SHERIFF	31								
SECURITY GUARD	14		39						POLICE SCIENCE
TOTAL	45		39					6	
AIR CONDITIONING MECHANIC	32		52	74				(94)	AIR CONDITIONING
APPLIANCE REPAIR- MAN	18							18	APPLIANCE REPAIR
AUTO BODY MECH	2			13				(5)	AUTO BODY

TABLE 54 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR SOUTHWEST REGION OF KANSAS: 1972-1976

FAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS						PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING	BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	48	78	51	16					(97)	AUTO MECHANICS
AIRPLANE MECHANIC	(9)								(9)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	5								5	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	3								3	COMMERCIAL ART
PHOTOGRAPHER	5								5	PHOTOGRAPHY
CARPENTER ROOFER	24 2									CARPENTRY
		10	4	1						
TOTAL	26	10	4	1					11	
ELECTRICIAL	16			3					13	ELECTRICITY
PAINTER PLASTERER	20 1									PAINTING
TOTAL	21								21	
BRICK, STONE & TILE SETTERS	7									MASONRY
CEMENT & CONCRETE WORKERS	5									
		5								
TOTAL	12	5							7	
PLUMBERS & PIPE- FITTERS	21			1					20	PLUMBING
JANITORS & SEXTONS CHARWOMEN	184 41									CUSTODIAL SERVICES
TOTAL	225								225	
RAILROAD MECHANIC	0									DIESEL MECHANICS
DIESEL MECHANIC	19	4	35							
TOTAL	19	4	35						(20)	

TABLE 54 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR SOUTHWEST REGION OF KANSAS: 1972-1976

FAR SOUTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMEN	4		34	4					(34)	DRAFTING
LINEMEN	13								13	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	16 33			6 6						ELECTRONICS (VOC)
TOTAL	49			6 6					43	
FOREMEN	82								82	FOREMANSHIP
RADIO & TV MECH	3								3	RADIO & TV
PRINTING OCCUPA- TIONS	18		19	4					(5)	GRAPHIC ARTS
WELDERS	52	24	21	23	4				(20)	WELDING
MACHINISTS MACHINE TOOL OP	21 7									MACHINE SHOP
TOTAL	28	9 9	30 30	19 19					(30)	
SHEET METAL WKRS	16								16	SHEET METAL
COSMETOLOGISTS	82		81						1	COSMETOLOGY
SMALL ENGINE MECH	10								10	SMALL ENGINES
CABINETMAKERS	3								3	CABINETMAKING
TRUCK DRIVERS	130								130	TRUCK DRIVING
UPHOLSTERERS	3								3	UPHOLSTERING
EVACUATING & GRADING MACHINE OPERATORS	18								18	HEAVY EQUIPMENT

TABLE 55
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR NORTHWEST REGION OF KANSAS: 1972-1976

FAR NORTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
FARMER & FARM WKRS	117	101	13		27	5		(29)	PRODUCTION AG
AG MECHANICS OTHER RELATED MECHANICS	30 5								
TOTAL	35	15 15				2 2		18	AG MECHANICS
GROUNDKEEPERS & NURSERY WKRS	16					2		14	HORTICULTURE
AG SALES WKRS AG SERVICE WKRS AG PROCESSING WKRS	37 93 62								
TOTAL	192	32 32				10 10		150	AG SALES & SERVICE AG PRODUCTS
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	5								
TOTAL	5					1 1		4	AG RESOURCES AG FORESTRY
ADVERTISING AGENTS & SALESWORKERS	1	2						(1)	ADVERTISING
FINANCE & CREDIT WORKERS	1							1	FINANCE & CREDIT
MANUFACTURING SALESMEN	17							17	INDUSTRIAL
INSURANCE SALESMEN	17							17	INSURANCE
SERVICE STATION ATTENDANTS	12							12	PETROLEUM
REAL ESTATE AGENT	5							5	REAL ESTATE

TABLE 55 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR NORTHWEST REGION OF KANSAS: 1972-1976

FAR NORTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OTHER SALESWORKER N. E. C.	154	4 2 6 3 14 1 1 2			1 1 2					APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM
TOTAL	154	33			4				117	
DELIVERYMEN, CAB	26								26	TRANSPORTATION
DENTAL ASSISTANT	12								12	DENTAL ASSISTANT
DENTAL HYGIENIST	5								5	DENTAL HYGIENIST
DENTAL LAB TECH	1								1	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	26		99						(73)	LPN TRAINING
MEDICAL ASSISTANT	29								29	MEDICAL ASSISTANT
MEDICAL LAB ASST.	7								7	MEDICAL LAB ASST.
MEDICAL SECRETARY MEDICAL RECORD CLERK WARD CLERK	1 1 3									MEDICAL RECORD SECRETARY
TOTAL	5								5	
NURSE AIDE	65	2	13						50	NURSE AIDE

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TABLE 55 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR NORTHWEST REGION OF KANSAS: 1972-1976

FAR NORTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
REGISTERED NURSE	58					30 14			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	58					44		14	
TEACHER AIDE	7								CHILD CARE & GUIDANCE
CHILD CARE CENTER WORKERS	11								
PVT HOUSEHOLD CHILD CARE WKRS	11								
TOTAL	29							29	
LAUNDRY WORKERS	18								CLOTHING MANAGEMENT, PRODUCTION & SERVICES
SEWERS & STICHERS	11								
TOTAL	29							29	
COOKS	99								FOOD MANAGEMENT, PRODUCTION & SERVICES
WAITERS & WAITRESSES	104								
FOUNTAIN WORKERS	27								
BARTENDERS	4								
TOTAL	234							234	
STENO/SECRETARY & RELATED	221	3				47		171	SECRETARY/STENO
ACCOUNTING CLEPKS	18								ACCOUNTING & COMPUTING
BOOKKEEPERS	42								
BANK TELLERS	10								
CASHIERS	73			25		60			
TOTAL	143			25		60		58	

TABLE 55 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR NORTHWEST REGION OF KANSAS: 1972-1976

FAR NORTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OFFICE MACHINE OP KEYPUNCH OP	17 4								OFFICE MACHINES & KEYPUNCH	
TOTAL	21							21		
COMPUTER PROGRAM- MER COMPUTER OP	15 4								DATA PROCESSING	
TOTAL	19		32 32					(13)		
SHIPPING & RECEIV- ING CLKS	2							2	MATERIAL SUPPORT	
TELEPHONE OP	21							21	COMMUNICATIONS	
PERSONNEL CLKS	1							1	PERSONNEL	
MANAGER/SUPERVISOR	202					154		48	SUPERVISION	
OTHER CLERICAL	283	42		23		178		40	TYPING & OTHER CLERICAL N.E.C.	
CIVIL TECHNICIAN SURVEYOR	6 1								CIVIL TECHNOLOGY	
TOTAL	7							7		
ELECTRONICS TECH	3							3	ELECTRONICS TECH	
POLICE, DETECTIVE, SHERIFF SECURITY GUARD	13 7								POLICE SCIENCE	
TOTAL	20							20		
AIR CONDITIONING MECHANIC	19							19	AIR CONDITIONING	
APPLIANCE REPAIR- MAN	8							8	APPLIANCE REPAIR	
AUTO BODY MECH	3	16	185	7				(205)	AUTO BODY	

TABLE 55 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR NORTHWEST REGION OF KANSAS: 1972-1976

FAR NORTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
							BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
AUTO MECHANIC	16		312	9				(305)	AUTO MECHANICS
AIRPLANE MECHANIC	(6)							(6)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	0							0	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	1							1	COMMERCIAL ART
PHOTOGRAPHER	2							2	PHOTOGRAPHY
CARPENTER ROOFER	3 1								CARPENTRY
TOTAL	4		36 36					(32)	
ELECTRICIAN	4		78	2				(76)	ELECTRICITY
PAINTER PLASTERER	6 0								PAINTING
TOTAL	6							6	
BRICK, STONE & TILE SETTERS	2								MASONRY
CEMENT & CONCRETE WORKERS	2								
TOTAL	4							4	
PLUMBERS & PIPE- FITTERS	6			1				5	PLUMBING
JANITORS & SEXTONS CHARWOMEN	95 21								CUSTODIAL SERVICES
TOTAL	116							116	
RAILROAD MECHANIC DIESEL MECHANIC	0 9		115						DIESEL MECHANICS
TOTAL	9		115					(106)	

TABLE 55 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
FAR NORTHWEST REGION OF KANSAS: 1972-1976

FAR NORTHWEST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS	PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL			NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY					
DRAFTSMEN	1		42	2				(43)	DRAFTING
LINEMEN	6							6	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	6 13			3					ELECTRONICS (VOC)
TOTAL	19							16	
FOREMAN	33							33	FOREMANSHIP
RADIO & TV MECH	0							0	RADIO & TV
PRINTING OCCUPA- TIONS	8			2				6	GRAPHIC ARTS
WELDERS	22			13				9	WELDING
MACHINISTS MACHINE TOOL OP	10 3			11					MACHINE SHOP
TOTAL	13							2	
SHEET METAL WKRS	5							5	SHEET METAL
COSMETOLOGISTS	45		95					(50)	COSMETOLOGY
SMALL ENGINE MECH	4							4	SMALL ENGINES
CABINETMAKERS	1							1	CABINETMAKING
TRUCK DRIVERS	64							64	TRUCK DRIVING
UPHOLSTERERS	2							2	UPHOLSTERING
EVACUATING & GRADING MACHINE OPERATORS	5							5	HEAVY EQUIPMENT

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TABLE 56
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHWEST CENTRAL REGION OF KANSAS: 1972-1976

NORTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
FARMER & FARM WKRS	214	176			42	10			(14)	PRODUCTION AG
AG MECHANICS	42									
OTHER RELATED MECHANICS	10									
TOTAL	52	123 123				4 4			(75)	AG MECHANICS
GROUNDKEEPERS & NURSERY WKRS	35	28			7	3			(3)	HORTICULTURE
AG SALES WKRS	79									
AG SERVICE WKRS	139									
AG PPROCESSING WKRS	127									
TOTAL	345	12 18 30				21 21			294	AG SALES & SERVICE AG PRODUCTS
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	11									
		3				2				AG RESOURCES
TOTAL	11	3 6				2			3	AG FORESTRY
ADVERTISING AGENTS & SALESWORKERS	3	3	2						(2)	ADVERTISING
FINANCE & CREDIT WORKERS	2								2	FINANCE & CREDIT
MANUFACTURING SALESMEN	35		1						34	INDUSTRIAL
INSURANCE SALESMEN	36								36	INSURANCE
SERVICE STATION ATTENDANTS	19								19	PETROLEUM
REAL ESTATE AGENT	10								10	REAL ESTATE

TABLE 56 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHWEST CENTRAL REGION OF KANSAS: 1972-1976

NORTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS				PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL					BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
OTHER SALESWORKER N. E. C.	330	5 2 7 4 16 1	2 2 12 3 1		1 1 4 1				APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM
TOTAL	330	37	21		8			264	
DELIVERYMEN, CAB	52							52	TRANSPORTATION
DENTAL ASSISTANT	28							28	DENTAL ASSISTANT
DENTAL HYGIENIST	13							13	DENTAL HYGIENIST
DENTAL LAB TECH	3							3	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	72							72	LPN TRAINING
MEDICAL ASSISTANT	64							64	MEDICAL ASSISTANT
MEDICAL LAB ASST.	15							15	MEDICAL LAB ASST.
MEDICAL SECRETARY MEDICAL RECORD CLERK WARD CLERK	3 3 8								MEDICAL RECORD SECRETARY
TOTAL	14							14	
NURSE AIDE	171	5	29					137	NURSE AIDE

TABLE 56 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHWEST CENTRAL REGION OF KANSAS: 1972-1976

NORTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
REGISTERED NURSE	138					63 31			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	138					94		44	
TEACHER AIDE	14								CHILD CARE & GUIDANCE
CHILD CARE CENTER WORKERS	21								
PVT HOUSEHOLD CHILD CARE WKRS	23								
TOTAL	58							58	
LAUNDRY WORKERS	28								CLOTHING MANAGEMENT, PRODUCTION & SERVICE
SEWERS & STICHERS	26								
TOTAL	54							54	
COOKS	196								FOOD MANAGEMENT, PRODUCTION & SERVICES
WAITERS & WAITRESSES	193								
FOUNTAIN WORKERS	54								
BARTENDERS	8								
TOTAL	451							451	
STENO/SECRETARY & RELATED	514					102		412	SECRETARY/STENO
ACCOUNTING CLERKS	43								ACCOUNTING & COMPUTING
BOOKKEEPERS	84								
BANK TELLERS	22								
CASHIERS	154					131			
TOTAL	303					131		172	

TABLE 56 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHWEST CENTRAL REGION OF KANSAS: 1972-1974

NORTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS				PRIVATE SCHOOLS				
		VOCATIONAL - TECHNICAL					NON-VOCATIONAL PUBLIC TRAINING			BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
BEST COPY AVAILABLE	FFICE MACHINE OP EYPUNCH OP	51 13								OFFICE MACHINES & KEYPUNCH
	TOTAL	64							64	
	OMPUTER PROGRAM- MER OMPUTER OP	35 10								DATA PROCESSING
	TOTAL	45							45	
	IPPING & RECEIV- ING CLKS	5		39					(34)	MATERIAL SUPPORT
	ELEPHONE OP	54							54	COMMUNICATIONS
	ERSONNEL CLKS	9							9	PERSONNEL
	ANAGER/SUPERVISOR	449					334		115	SUPERVISION
	OTHER CLERICAL	601		4			386		211	TYPING & OTHER CLERICAL N.E.C.
	CIVIL TECHNICIAN RVEYOR	14 3								CIVIL TECHNOLOGY
TOTAL	17							17		
ELECTRONICS TECH	6							6	ELECTRONICS TECH	
OLICE, DETECTIVE, HERIFF SECURITY GUARD	42 21								POLICE SCIENCE	
TOTAL	63							63		
R CONDITIONING ECHANIC	40							40	AIR CONDITIONING	
PLIANCE REPAIR- AN	17							17	APPLIANCE REPAIR	
TO BODY MECH	6			16				(10)	AUTO BODY	

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TABLE 56(continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHWEST CENTRAL REGION OF KANSAS: 1972-1976

NORTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	34	22		18					(6)	AUTO MECHANICS
AIRPLANE MECHANIC	(13)								(13)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	1								1	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	2								2	COMMERCIAL ART
PHOTOGRAPHER	4								4	PHOTOGRAPHY
CARPENTER ROOFER	7 1									CARPENTRY
TOTAL	8	30 30		1 1					(23)	
ELECTRICIAN	9			4					5	ELECTRICITY
PAINTER PLASTERER	11 1									PAINTING
TOTAL	12								12	
BRICK, STONE & TILE SETTERS	4									MASONRY
CEMENT & CONCRETE WORKERS	3							5 5		
TOTAL	7								2	
PLUMBERS & PIPE- FITTERS	15			2					13	PLUMBING
JANITORS & SEXTONS CHARWOMEN	203 42									CUSTODIAL SERVICES
TOTAL	245								245	
RAILROAD MECHANIC	0									DIESEL MECHANICS
DIESEL MECHANIC	18									
TOTAL	18								18	

TABLE 56(continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHWEST CENTRAL REGION OF KANSAS: 1972-1976

NORTHWEST CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
DRAFTSMEN	3			4				(1)	DRAFTING
LINEMEN	28							28	LINEMAN
ELECTRONIC MECH ELECTRONIC ASSEMBLER	13 27			7					ELECTRONICS (VOC)
TOTAL	40			7				33	
FOREMEN	71							71	FOREMANSHIP
RADIO & TV MECH	1							1	RADIO & TV
PRINTING OCCUPA- TIONS	17			5				12	GRAPHIC ARTS
WELDERS	45			27				18	WELDING
MACHINISTS MACHINE TOOL OP	20 6			23					MACHINE SHOP
TOTAL	26			23				3	
SHEET METAL WKRS	11							11	SHEET METAL
COSMETOLOGISTS	96							96	COSMETOLOGY
SMALL ENGINE MECH	8							8	SMALL ENGINES
CABINETMAKERS	4							4	CABINETMAKING
TRUCK DRIVERS	130							130	TRUCK DRIVING
UPHOLSTERERS	4							4	UPHOLSTERING
EVACUATING & GRADING MACHINE OPERATORS	12							12	HEAVY EQUIPMENT

TABLE 57
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTH CENTRAL REGION OF KANSAS: 1972-1976

NORTH CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS						PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING	BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
FARMER & FARM WKRS	189	114	32		35	12			(4)	PRODUCTION AG
AG MECHANICS	47									
OTHER RELATED MECHANICS	5									
		33	6			5				AG MECHANICS
TOTAL	52	33	6			5			8	
GROUNDKEEPERS & NURSERY WKRS	10	4			1	4			1	HORTICULTURE
AG SALES WKRS	113									
AG SERVICE WKRS	230									
AG PROCESSING WKRS	199	2			1	25				AG SALES & SERVICE AG PRODUCTS
TOTAL	542	2			1	25			514	
WORKERS IN CONSERVATION & MANAGEMENT OF NATURAL RESOURCES	13									
		3			1	3				AG RESOURCES
		3								AG FORESTRY
TOTAL	13	6			1	3			3	
ADVERTISING AGENTS & SALESWORKERS	4	9	5		2				(12)	ADVERTISING
FINANCE & CREDIT WORKERS	4	1	1						2	FINANCE & CREDIT
MANUFACTURING SALESMEN	50	1	2						47	INDUSTRIAL
INSURANCE SALESMEN	52								52	INSURANCE
SERVICE STATION ATTENDANTS	24	1	1						22	PETROLEUM
REAL ESTATE AGENT	14	1							13	REAL ESTATE

TABLE 57 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTH CENTRAL REGION OF KANSAS: 1972-1976

NORTH CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
OTHER SALESWORKER N. E. C.	472	18 8 1 24 13 57 5 2 1 6	8 1 1 5 38 10 4		3 1 4 2 12 2 1 1		38	APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICE GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM	
TOTAL	472	135	67		26		38	206	
DELIVERYMEN, CAB	76	1						75	TRANSPORTATION
DENTAL ASSISTANT	35							35	DENTAL ASSISTANT
DENTAL HYGIENIST	15							15	DENTAL HYGIENIST
DENTAL LAB TECH	4							4	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	121		151					(30)	LPN TRAINING
MEDICAL ASSISTANT	80							80	MEDICAL ASSISTANT
MEDICAL LAB ASST.	19							19	MEDICAL LAB ASST.
MEDICAL SECRETARY MEDICAL RECORD CLERK WARD CLERK	4 4 10						100		MEDICAL RECORD SECRETARY
TOTAL	18						100	(82)	
NURSE AIDE	269	5	34					230	NURSE AIDE

TABLE 57 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTH CENTRAL REGION OF KANSAS: 1972-1976

NORTH CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
REGISTERED NURSE	201					76 37			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	201					113		88	
TEACHER AIDE	12								CHILD CARE & GUIDANCE
CHILD CARE CENTER WORKERS	18								
PVT HOUSEHOLD CHILD CARE WKRS	27								
TOTAL	57							57	
LAUNDRY WORKERS	45								CLOTHING MANAGEMENT, PRODUCTION & SERVICES
SEWERS & STICHERS	27								
TOTAL	72							72	
COOKS	210								FOOD MANAGEMENT, PRODUCTION & SERVICES
WAITERS & WAITRESSES	247								
FOUNTAIN WORKERS	56								
BARTENDERS	10								
TOTAL	523							523	
STENO/SECRETARY & RELATED	563		32			120		868 (457)	SECRETARY/STENO
ACCOUNTING CLERKS	50								ACCOUNTING & COMPUTING
BOOKKEEPERS	112								
BANK TELLERS	32								
CASHIERS	189		9			154			
TOTAL	383		9			154		220	

TABLE 57 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTH CENTRAL REGION OF KANSAS: 1972-1976

NORTH CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
OFFICE MACHINE OP KEYPUNCH OP	58 15								OFFICE MACHINES & KEYPUNCH	
TOTAL	73							73		
COMPUTER PROGRAM- MER	40								DATA PROCESSING	
COMPUTER OP	11		36				125			
TOTAL	51		36				125	(110)		
SHIPPING & RECEIV- ING CLKS.	5		2					3	MATERIAL SUPPORT	
TELEPHONE OP	59							59	COMMUNICATIONS	
PERSONNEL CLKS	4							4	PERSONNEL	
MANAGER/SUPERVISOR	558					393	38	127	SUPERVISION	
OTHER CLERICAL	694	32	34			455		173	TYPING & OTHER CLERICAL N.E.C.	
CIVIL TECHNICIAN SURVEYOR	30 6								CIVIL TECHNOLOGY	
TOTAL	36							36		
ELECTRONICS TECH	22							22	ELECTRONICS TECH	
POLICE, DETECTIVE, SHERIFF	26								POLICE SCIENCE	
SECURITY GUARD	16									
TOTAL	42							42		
AIR CONDITIONING MECHANIC	51	57	57	74				(137)	AIR CONDITIONING	
APPLIANCE REPAIR- MAN	21							21	APPLIANCE REPAIR	
AUTO BODY MECH	6			19				(13)	AUTO BODY	

TABLE 57 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTH CENTRAL REGION OF KANSAS: 1972-1976

NORTH CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING		BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	38	34	211	22					(229)	AUTO MECHANICS
AIRPLANE MECHANIC	(7)		32						(39)	AVIATION OCCUPATION
OFFICE MACHINE MECHANIC	3								3	BUSINESS MACHINE REPAIR
COMMERCIAL ARTIST	4	15	47						(58)	COMMERCIAL ART
PHOTOGRAPHER	6								6	PHOTOGRAPHY
CARPENTER ROOFER	58 5									CARPENTRY
TOTAL	63		81	1			2		(21)	
ELECTRICIAN	32	3	19	4			2		4	ELECTRICITY
PAINTER PLASTERER	38 1									PAINTING
TOTAL	39								39	
BRICK, STONE & TILE SETTERS	14									MASONRY
CEMENT & CONCRETE WORKERS	10						12			
TOTAL	24						12		12	
PLUMBERS & PIPE- FITTERS	36			2			1		33	PLUMBING
JANITORS & SEXTONS CHARWOMEN	209 56									CUSTODIAL SERVICES
TOTAL	265								265	
RAILROAD MECHANIC DIESEL MECHANIC	0 23									DIESEL MECHANICS
TOTAL	23	36 36	136 136						(149)	

TABLE 57 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTH CENTRAL REGION OF KANSAS: 1972-1976

NORTH CENTRAL REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS	BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMEN	19	6	22	5					(14)	DRAFTING
LINEMEN	30								30	LINEMAN
ELECTRONIC MECH	17									ELECTRONICS (VOC)
ELECTRONIC ASSEMBLER	34									
TOTAL	51	9	150	8					(116)	
FOREMEN	112								112	FOREMANSHIP
RADIO & TV MECH	0								0	RADIO & TV
PRINTING OCCUPATIONS	24			6					18	GRAPHIC ARTS
WELDERS	75	54	145	33					(157)	WELDING
MACHINISTS	35									MACHINE SHOP
MACHINE TOOL OP	8									
TOTAL	43	6	26	28					(17)	
SHEET METAL WKRS	34						2		32	SHEET METAL
COSMETOLOGISTS	115								115	COSMETOLOGISTS
SMALL ENGINE MECH	10								10	SMALL ENGINES
CABINETMAKERS	4								4	CABINETMAKING
TRUCK DRIVERS	153								153	TRUCK DRIVING
UPHOLSTERERS	4								4	UPHOLSTERING
EVACUATING & GRADING MACHINE OPERATORS	32		85						(53)	HEAVY EQUIPMENT

TABLE 58
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHEAST REGION OF KANSAS: 1972-1976

BEST COPY AVAILABLE

NORTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
						BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS			
FARMER & FARM WKRS	179	194			49	11		(75)	PRODUCTION AG
AG MECHANICS	46								
OTHER RELATED MECHANICS	9								
TOTAL	55	50				4		1	AG MECHANICS
		50				4			
GROUNDKEEPERS & NURSERY WFRS	28	4			1	4		19	HORTICULTURE
AG SALES WKRS	67								
AG SERVICE WKRS	145								
AG PROCESSING WKRS	108	55			11	22			AG SALES & SERVICE
		8			2				AG PRODUCTS
TOTAL	320	63			13	22		222	
WORKERS IN CONSER- VATION & MANAGE- MENT OF NATURAL RESOURCES	12								
		26				2			AG RESOURCES
TOTAL	12	26				2		(16)	AG FORESTRY
ADVERTISING AGENTS & SALESWORKERS	2	3						(1)	ADVERTISING
FINANCE & CREDIT WORKERS	2							2	FINANCE
MANUFACTURING SALESMEN	30							30	INDUSTRIAL
INSURANCE SALESMEN	30							30	INSURANCE
SERVICE STATION ATTENDANTS	9							9	PETROLEUM
REAL ESTATE AGENT	8							8	REAL ESTATE

TABLE 58 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHEAST REGION OF KANSAS: 1972-1976

NORTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
OTHER SALESWORKER N. E. C.	278	5 2 7 4 16 1			1 1 1 2				APPAREL & ACCESSORIES AUTOMOBILE FLORISTRY FOOD DISTRIBUTION FOOD SERVICES GENERAL MERCHANDISE HARDWARE & BUILDING HOME FURNISHINGS HOTEL & LODGING INTERNATIONAL TRADE PERSONAL SERVICES RECREATION & TOURISM
TOTAL	278	37			5			236	
DELIVERYMEN, CAB	118							118	TRANSPORTATION
DENTAL ASSISTANT	30							30	DENTAL ASSISTANT
DENTAL HYGIENIST	12							12	DENTAL HYGIENIST
DENTAL LAB TECH	3							3	DENTAL LAB TECH
LICENSED PRACTICAL NURSE	36		116					(80)	LPN TRAINING
MEDICAL ASSISTANT	69							69	MEDICAL ASSISTANT
MEDICAL LAB ASST.	15							15	MEDICAL LAB ASST.
MEDICAL SECRETARY MEDICAL RECORD CLERK WARD CLERK	3 3 9								MEDICAL RECORD SECRETARY
TOTAL	15							15	
NURSE AIDE	96	5	30					61	NURSE AIDE

TABLE 58 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHEAST REGION OF KANSAS: 1972-1976

NORTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
REGISTERED NURSE	101					68 33			DIPLOMA NURSE BACCALAUREATE NURSE ASSOCIATE DEGREE NURSE
TOTAL	101					101		0	
TEACHER AIDE	8								CHILD CARE & GUIDANCE
CHILD CARE CENTER WORKERS	12								
PVT HOUSEHOLD CHILD CARE WKRS	24								
TOTAL	44							44	
LAUNDRY WORKERS	18								CLOTHING MANAGEMENT, PRODUCTION & SERVICES
SEWERS & STICHERS	24								
TOTAL	42							42	
COOKS	135								FOOD MANAGEMENT, PRODUCTION & SERVICES
WAITERS & WAITRESSES	139								
FOUNTAIN WORKERS	37								
BARTENDERS	4	135							
TOTAL	315	135						180	
STENO/SECRETARY & RELATED	395	12	10			107		266	SECRETARY/STENO
ACCOUNTING CLERKS	30								ACCOUNTING & COMPUTING
BOOKKEEPERS	75								
BANK TELLERS	17								
CASHIERS	128	2	9			137			
TOTAL	250	2	9			137		102	

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TABLE 58 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHEAST REGION OF KANSAS: 1972-1976

NORTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS		
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING			
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES				
OFFICE MACHINE OP KEYPUNCH OP	33 8								OFFICE MACHINES & KEYPUNCH
TOTAL	41							41	
COMPUTER PROGRAM- MER COMPUTER OP	28 8								DATA PROCESSING
TOTAL	36							36	
SHIPPING & RECEIV- ING CLKS	3							3	MATERIAL SUPPORT
TELEPHONE OP	34							34	COMMUNICATIONS
PERSONNEL CLKS	1							1	PERSONNEL
MANAGER/SUPERVISOR	300					350		(50)	SUPERVISION
OTHER CLERICAL	521	82	17			405		17	TYPING & OTHER CLERICAL N.E.C.
CIVIL TECHNICIAN SURVEYOR	11 2								CIVIL TECHNOLOGY
TOTAL	13							13	
ELECTRONICS TECH	9							9	ELECTRONICS TECH
POLICE, DETECTIVE, SHERIFF SECURITY GUARD	21 12								POLICE SCIENCE
TOTAL	33							33	
AIR CONDITIONING MECHANIC	55							55	AIR CONDITIONING
APPLIANCE REPAIR- MAN	14							14	APPLIANCE REPAIR
AUTO BODY MECH	4			17				(13)	AUTO BODY

TABLE 58 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHEAST REGION OF KANSAS: 1972-1976

NORTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY							NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
AUTO MECHANIC	24	22	35	19				(52)	AUTO MECHANICS	
AIRPLANE MECHANIC	(18)							(18)	AVIATION OCCUPATION	
OFFICE MACHINE MECHANIC	0							0	BUSINESS MACHINE REPAIR	
COMMERCIAL ARTIST	2							2	COMMERCIAL ART	
PHOTOGRAPHER	4							4	PHOTOGRAPHY	
CARPENTER ROOFER	(10) 1								CARPENTRY	
TOTAL	(9)	7	8	1				(25)		
ELECTRICIAN	6			4			1	1	ELECTRICITY	
PAINTER PLASTERER	5 0								PAINTING	
TOTAL	5							5		
BRICK, STONE & TILE SETTERS	2								MASONRY	
CEMENT & CONCRETE WORKERS	3									
TOTAL	5							5		
PLUMBERS & PIPE- FITTERS	12			2				10	PLUMBING	
JANITORS & SEXTONS CHARWOMEN	163 35								CUSTODIAL SERVICES	
TOTAL	198							198		
RAILROAD MECHANIC DIESEL MECHANIC	0 16								DIESEL MECHANICS	
TOTAL	16							16		

TABLE 58 (continued)
NET SUBPROFESSIONAL MANPOWER NEEDS IN THE
NORTHEAST REGION OF KANSAS: 1972-1976

NORTHEAST REGION

CLUSTERS OF OCCUPATIONS	MANPOWER NEEDS	MANPOWER SUPPLY						NET MANPOWER NEEDS	CLUSTERS OF TRAINING PROGRAMS	
		PUBLIC SCHOOLS					PRIVATE SCHOOLS			
		VOCATIONAL - TECHNICAL				NON-VOCATIONAL PUBLIC TRAINING				BUREAU OF APPRENTICESHIP, MANPOWER DEVELOPMENT TRAINING, AND BUREAU OF CORRECTIONS
		SECONDARY	POST SECONDARY	ADULT PREPARATORY	DELAYED ENTRIES					
DRAFTSMEN	2			5				(3)	DRAFTING	
LINEMEN	19							19	LINEMAN	
ELECTRONIC MECH ELECTRONIC ASSEMBLER	11 22									
TOTAL	33	2	18	7				6	ELECTRONICS (VOC)	
FOREMEN	59							59	FOREMANSHIP	
RADIO & TV MECH	(1)							(1)	RADIO & TV	
PRINTING OCCUPA- TIONS	12	17	42	5				(52)	GRAPHIC ARTS	
WELDERS	47	6	34	29				(22)	WELDING	
MACHINISTS MACHINE TOOL OP	23 7									
TOTAL	30			25 25				5	MACHINE SHOP	
SHEET METAL WKRS	6							6	SHEET METAL	
COSMETOLOGISTS	103							103	COSMETOLOGY	
SMALL ENGINE MECH	7							7	SMALL ENGINES	
CABINETMAKERS	3						11	(8)	CABINETMAKING	
TRUCK DRIVERS	118							118	TRUCK DRIVING	
UPHOLSTERERS	3							3	UPHOLSTERING	
EVACUATING & GRADING MACHINE OPERATORS	6							6	HEAVY EQUIPMENT	

Chapter 43

THE DEMAND FOR UPGRADING TRAINING

BACKGROUND

Most vocational and technical training is directed toward those individuals preparing for an entry level occupation. Perhaps the most seriously neglected area in the field of vocational education is the training of those individuals in the labor force who need to improve their present skills in the light of advancing technology and changing economic conditions.

PURPOSE

This chapter is devoted to identifying selected groups of workers who are already employed and could benefit from additional training. Further, the chapter will reflect that proportion of the training which employers feel should be the responsibility of public education.

SCOPE

The following parameters define the scope of this chapter:

1. The factors reflecting the training needs of employees and the amount of training for which public education should be responsible are based on the responses from 922 Kansas employers.
2. Forty-six skilled and semi-skilled occupations are examined.
3. The figures indicate only the need for upgrading and do not reflect how long or how extensive the upgrading training should be.

ASSUMPTIONS

1. The modified BLS matrix technique produces reasonably accurate occupational profile projections.

2. Employers can make reasonably accurate estimates of the needs for skill upgrading of their employees.

PROCEDURES

Estimated employment by specified occupations in Kansas for 1973 was generated by the modified BLS matrix technique. Nine hundred and twenty-two Kansas employers, covering 46 occupations, were surveyed to determine: (1) the percent of workers needing additional training; and (2) the percent of the training that should be conducted by public education.

The estimated employment in a specified occupation (Column 1) was multiplied by the annualized percentage of employees needing skills upgrading (Column 2) giving annualized number of employees needing upgrading training (Column 3).

The figure in Column 3 is multiplied by the factor in Column 4 (percent of training requested of public education) resulting in the number of individuals needing upgrading training through Public Education (Column 5).

TABLE 59
DEMAND FOR SKILLS UPGRADING IN KANSAS

OCCUPATION	TOTAL EMPLOYMENT	Annual Percent Needing Skills Upgraded	Annual Employment Needing Skills Upgraded	Percentage of Training Assistance Requested from Public Education	Annual Employment Requesting Upgrading Training from Public Education
Accounting Clerks	5,435	.33	1,794	.10	179
Airplane Mechanics	3,306	.67	2,215	.09	199
Assembly Metalworkers	3,142	.64	2,011	.31	623
Attendants, Hospital & Other	13,771	.98	13,496	.21	2,834
Auto Mechanics	10,034	.65	6,522	.10	652
Bakers	1,159	.73	846	.15	127
Bank Tellers	2,040	.80	1,632	.04	65
Bookkeepers, Hand	10,713	.39	4,178	.14	585
Brick Masons	1,654	.60	992	.00	0
Cabinetmakers	616	.68	419	.19	80
Carpenters	10,722	.55	5,897	.11	649
Cashiers	10,584	.65	6,880	.06	413
Cement & Concrete Finishers	700	.48	336	.13	44
Charwomen & Cleaners	2,796	.60	1,678	.08	134
Clerks	140,652	.36	50,635	.18	9,114
Cooks	13,294	.98	13,028	.27	3,518
Draftsmen	2,306	.40	922	.32	295
Electricians	3,868	.63	2,437	.07	171
Excavating, Grading, & Machine Operators	3,949	.43	1,648	.25	412
Firemen	2,001	.95	1,901	.32	608
Janitors & Sextons	13,114	.69	9,049	.13	176
Linemen	5,020	.91	4,568	.00	0
Machinists	4,643	.53	2,451	.33	812
Machine Tool Operators	1,707	.67	1,144	.24	275
Meat Cutters	2,451	.53	1,299	.11	143
Metalworkers, Inspection	1,239	.38	471	.18	85
Nurses, Practical	5,059	.53	2,681	.48	1,287
Nurses, Professional	11,078	.91	10,081	.32	3,226

TABLE 59 (continued)
DEMAND FOR SKILLS UPGRADING IN KANSAS

OCCUPATION	TOTAL EMPLOYMENT	Annual Percent Needing Skills Upgraded	Annual Employment Needing Skills Upgraded	Percentage of Training Assistance Requested from Public Education	Annual Employment Requesting Upgrading Training from Public Education
Office Machine Repairmen	542	.75	407	.05	20
Painters	4,368	.62	2,708	.05	135
Photographers	705	.59	417	.00	0
Plumbers & Pipefitters	3,852	.56	2,159	.11	237
Policemen	3,617	1.42*	5,136*	.16	822
Printing Trades Craftsmen	3,985	.77	3,068	.18	552
Radio & TV Repairmen	1,460	1.25*	1,825*	.00	0
Roofer	512	.47	241	.09	22
Sales Workers	70,269	.74	51,999	.03	1,560
Secretaries & Stenos	34,751	.36	12,510	.23	2,877
Security Guards	2,012	1.03*	2,072*	.06	124
Sewers & Stitchers	2,786	.24	669	.00	0
Sheetmetal Workers	4,458	.51	2,274	.22	500
Surveyors	625	.41	256	.20	51
Technicians, Med. & Dental	3,799	.75	2,849	.11	313
Upholsterers	699	.67	448	.15	67
Waiters & Waitresses	15,736	.88	13,848	.18	2,493
Welders & Flame Cutters	7,185	.69	4,958	.22	1,091

* Employers of workers in these occupations feel that skill upgrading is needed more than once a year.

Chapter 44

STUDENT INTEREST RATINGS OF VOCATIONAL AND TECHNICAL PROGRAMS

BACKGROUND

Vacant seats or stations in the vocational or technical education classroom represent a waste of the taxpayer's money. Both student interest and manpower needs must be considered when planning vocational and technical education.

In the past, vocational and technical education planners have either not had any data on student interest or have had data generated by a student interest scale. Many planners feel that some objective measure of student action is necessary to obtain a realistic picture of how potential students will react to various program offerings.

In 1971, a new counseling technique (called K-VIEW) was introduced in Kansas. This technique provides potential vocational or technical students with an opportunity to scan occupational information at their leisure. A student can go to the library in his home school, select any one of over 150 occupations and review materials related to that occupation. This is a student initiated action which is related to his occupational and hence educational preference. This chapter will use occupational references by students using the K-VIEW system as a predictor of student interest.

PURPOSE

The purpose of this chapter is to gain some insight into student preference relative to particular occupations.

LIMITATIONS

1. It is possible that the availability of training influences the selection of K-VIEW materials by students.

2. Despite the fact that the job cards available in the K-VIEW system are assumed to include the majority of sub-professional jobs which interest potential Kansas vocational and technical students, there may be additional occupations which should be represented in the K-VIEW system.

3. The K-VIEW system is new and the number of references to date limited. As the system matures, the student interest data obtained should become more relevant to vocational-technical program planners.

PROCEDURE

Since the fall of 1971, over 1,000 K-VIEW references have been reported. Student references have been tabulated by occupations and clustered using the Bureau of Census occupational categories as a guide. These occupational clusters are defined as follows:

Agricultural Workers

Workers in these occupations are concerned with growing, harvesting, catching, and gathering land and aquatic plant and animal life and the products thereof; and occupations concerned with providing services in support of these activities.

Clerical Workers

These are workers concerned with making, classifying and filing records including written communications.

Construction Workers

These workers are in craft and non-craft occupations, not elsewhere classified, concerned with the building and repairing of structures.

Drivers and Deliverymen

These workers are concerned with transporting cargo over highways, city streets, or within compounds of industrial construction or mining areas, by driving vehicles powered by gasoline, diesel, propane, or related fuels, or electricity.

Food Service Workers

This area includes workers concerned with preparing food and beverages and serving them to patrons of such establishments as hotels, clubs, restaurants, and cocktail lounges.

Mechanics and Repairmen

Workers in this group are concerned with repairing engines and accessories, power trains, suspension systems, and other mechanical units of automobiles, trucks, tractors, buses, and trackless trolley; graders, bulldozers, cranes, power shovels, portable air compressors, and other gasoline or diesel-powered engineering equipment; motorized materials, handling equipment and wheeled or tracked military vehicles.

Medical Workers

These workers include those subprofessionals concerned with the health care of humans or animals or work in occupations in sanitation, environmental and public health, or in laboratories or other health facilities.

Metal Craftsmen

Workers in this area are concerned with shaping and conditioning metal by rolling, forging, extruding, drawing out, punching, blanking, and press working.

Printing Craftsmen

This group includes workers concerned with assembling and setting type matter for printing by means of typesetting or composing machines. It includes craftsmen at linotype machines which assemble letters into lines and cast strips of type from type metal, and monotype machines which compose type matter in separate letters.

Protective Service Workers

Workers in this area are concerned with protecting the public against crime, fire, accidents, and acts of war.

Salesworkers

These workers are to be found in occupations concerned with selling commodities when knowledge of the commodities sold is required.

Service Workers N.E.C.

These are workers in service occupations that have not been previously classified.

Technicians N.E.C.

These are workers in technical occupations not classified as medical.

Textile Occupations

Workers in these occupations are concerned with shaping, joining, spinning, weaving and otherwise fabricating textiles, textile products, fur and hair.

Transportation and Public Utilities N.E.C.

These are occupations concerned with generation, transmission, and distribution of electricity; generation and distribution of steam for heat and power, including marine propulsion; generation of utility gas, and storage and distribution of natural and manufactured gas for power, illumination, or heating purposes; filtration, purification, and distribution of water for domestic, commercial, or industrial consumption; and collection, treatment, and disposal of sewage and refuse.

This division includes operators concerned with moving people or materials by means of automotive and railway vehicles, aircraft, freshwater or seagoing vessels, pipes, and pumps. Their activities include loading bulk materials into conveyances; ascertaining number of passengers and amount and kind of materials being conveyed; directing course of carrier; routing materials; servicing carriers; and related activities.

TABLE 60
RANK ORDERING OF VOCATIONAL-TECHNICAL JOB
CLUSTERS BY NUMBER OF K-VIEW REFERENCES

PROGRAM	RANK	NO. OF REFERENCES
Technicians N.E.C.	1	176
Clerical Workers	2.5	161
Medical Workers	2.5	161
Mechanics and Repairmen	4	116
Metal Craftsmen	5	97
Salesworkers	6	80
Service Workers N.E.C.	7	67
Construction Workers	8	58
Agricultural Workers	9	46
Drivers and Deliverymen	10	43
Textile Occupations	11	34
Food Service Workers	12	25
Protective Service Workers	13	24
Transportation and Public Utilities Workers N.E.C.	14	22
Printing Craftsmen	15	9

Chapter 45

POPULATIONS OF POTENTIAL STUDENTS

BACKGROUND

This chapter is concerned with identifying populations which could potentially benefit from preparatory vocational or technical training. Included here are (1) the disadvantaged, (2) the handicapped, (3) the unemployed, and (4) high school students who will not complete higher education. These groupings were selected relative to groups described in the 1968 Vocational Education Act Amendments. It is entirely possible and indeed probable that other populations not included here could also benefit from vocational training.

PURPOSE

The purpose of this chapter is to estimate the size and geographic location of selected disadvantaged, handicapped, unemployed and high school student groups.

SCOPE

1. The various potential student populations will be identified by estimated number per county.

2. The populations may overlap, i.e., an individual may be represented in more than one category, therefore, the estimated total population of potential vocational and technical students cannot be derived as a sum of the various categories of students.

ASSUMPTIONS

1. The handicapped are distributed randomly throughout the state. This assumption is somewhat questionable in that handicaps are found more

frequently among the lower socioeconomic groups which are not necessarily distributed randomly throughout the state, however, as a rough estimate the figures should be usable.

2. The percent of high school students who will not complete a higher education program will remain relatively constant throughout the state (on a county basis). Again, the limitations of geographic distributions of socio-economic groups play the part of an intervening variable although as in "1" above, the figures should be satisfactory for rough estimates.

3. Average unemployment figures in the near future will be similar to unemployment figures in 1971.

PROCEDURES

1. Academic Disadvantaged: These figures were derived from updated 1970 census data and present figures on the numbers of persons 25 years old or older who have not graduated from the eighth grade.

2. Economically Disadvantaged: These figures are based on updated 1970 census data and indicate the number of disadvantaged persons by county (that is persons in families where the income is \$3,670 or less).

3. Culturally Disadvantaged: These figures represent the numbers of non-whites by county as reported by the 1970 census. It is recognized that many non-whites are not culturally disadvantaged, however, many whites are culturally disadvantaged. These are probably conservative figures.

4. Handicapped: These figures are based on national frequency percentages applied to county populations. The frequency percentages were provided by Mr. James Marshall of the State Department of Education.

5. Unemployed: The data on unemployment was provided by the State Employment Security Office. These figures are based on the average rates in each county for the past year.

6. High School Students Who Will not Complete Higher Education: The information on students who will not complete higher education was acquired from the Annual Statistical Report for 1969-1970 (Kansas State Department of Education) and current data on the average number of higher education graduates in Kansas. The number of high school juniors and seniors in 1966-67 was divided into twice the number of higher education completions

in 1971 to give the most current estimate of the percent of high school juniors and seniors who will complete a baccalaureate degree. The converse of this percentage was then multiplied times the number of high school juniors and seniors presently in Kansas schools to determine an estimated number of high school juniors and seniors who will not complete a higher education degree.

TABLE 61
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Will Not Complete Higher Education
		Academic (25 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Allen													
0-15	4,017		570	102	80	80	40	20	20	4	141		
16-17	585		83	10	12	12	6	3	3	1	21		398
18-54	5,785	(934)	821	132	116	116	58	29	29	6	203	(225)	
55-	4,656		661	71	93	93	47	23	23	5	163		
Anderson													
0-15	2,412		376	7	48	48	24	12	12	2	84		
16-17	353		55	2	7	7	4	2	2	0	12		225
18-54	3,055	(452)	476	11	61	61	31	15	15	3	107	(75)	
55-	2,681		418	18	54	54	27	13	13	3	94		
Atchison													
0-15	5,469		727	459	109	109	55	27	27	5	191		
16-17	707		94	80	14	14	7	4	4	1	25		363
18-54	8,328	(869)	1,108	475	167	167	83	42	42	8	291	(250)	
55-	4,661		619	259	93	93	47	23	23	5	163		
Barber													
0-15	1,876		126	30	38	38	19	9	9	2	66		
16-17	299		20	2	6	6	3	2	2	0	11		162
18-54	2,804	(327)	187	35	56	56	28	14	14	3	99	(75)	
55-	2,037		136	12	41	41	20	10	10	2	71		
Barton													
0-15	9,679		716	188	194	194	97	48	48	10	339		
16-17	1,367		101	29	27	27	14	7	7	1	48		853
18-54	13,173	(1,163)	974	222	263	263	132	66	66	13	461	(500)	
55-	6,444		476	111	129	129	64	32	32	6	226		
Bourbon													
0-15	3,637		575	140	73	73	36	18	18	4	127		
16-17	552		87	26	11	11	6	3	3	1	19		344
18-54	6,094	(852)	963	174	122	122	61	31	31	6	213	(225)	
55-	4,932		779	133	99	99	49	25	25	5	173		
Brown													
0-15	2,985		507	208	60	60	30	15	15	3	104		
16-17	428		73	24	9	9	4	2	2	0	15		260
18-54	4,286	(571)	729	188	86	86	43	21	21	4	150	(125)	
55-	3,986		678	110	80	80	40	20	20	4	140		
Butler													
0-15	11,532		1,026	141	231	231	115	58	58	12	404		
16-17	1,623		144	10	33	33	16	8	8	2	57		1,084
18-54	17,201	(1,521)	1,531	192	344	344	172	86	86	17	602	(1,650)1	
55-	8,302		739	54	166	166	83	42	42	8	291		
Chase													
0-15	837		105	15	17	17	8	4	4	1	29		
16-17	130		16	0	3	3	1	1	1	0	5		83
18-54	1,280	(214)	161	9	26	26	13	6	6	1	45	(25)	
55-	1,161		146	8	23	23	12	6	6	1	41		
Chautauqua													
0-15	1,044		234	16	21	21	10	5	5	1	37		
16-17	158		35	3	3	3	2	1	1	0	5		102
18-54	1,630	(320)	365	27	33	33	16	8	8	2	57	(50)	
55-	1,815		407	33	36	36	18	9	9	2	64		
Cherokee													
0-15	5,904		1,145	122	118	118	59	30	30	6	207		
16-17	779		151	10	16	16	8	4	4	1	27		407
18-54	8,758	(1,571)	1,699	157	175	175	88	44	44	9	307	(400)	
55-	6,108		1,185	127	122	122	61	31	31	6	214		
Cheyenne													
0-15	1,161		132	1	23	23	12	6	6	1	41		
16-17	191		22	0	4	4	2	1	1	0	7		177
18-54	1,699	(419)	194	1	34	34	17	9	9	2	60	(25)	
55-	1,205		137	1	24	24	12	6	6	1	42		
Clark													
0-15	770		30	2	15	15	8	4	4	1	27		
16-17	102		4	0	2	2	1	1	1	0	4		84
18-54	1,094	(162)	43	4	22	22	11	6	6	1	38	(25)	
55-	930		36	6	19	19	9	5	5	1	33		

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Will Not Complete Higher Education
		Academic (25 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Clay													
0-15	2,537		335	8	51	51	25	13	13	3	89		
16-17	405		53	1	8	8	4	2	2	0	14		246
18-54	3,712	(382)	490	11	74	74	37	19	19	4	130	(100)	
55-	3,236		427	4	65	65	32	16	16	3	113		
Cloud													
0-15	3,545		369	11	71	71	35	18	18	4	124		
16-17	523		54	0	11	11	5	3	3	1	18		306
18-54	5,172	(637)	538	12	103	103	52	26	26	5	181	(125)	
55-	4,226		440	6	85	85	42	21	21	4	148		
Coffey													
0-15	1,839		298	4	37	37	18	9	9	2	64		
16-17	280		45	1	6	6	3	1	1	0	10		190
18-54	2,560	(320)	414	10	51	51	26	13	13	3	90	(75)	
55-	2,718		440	0	54	54	27	14	14	3	95		
Commanche													
0-15	678		69	0	14	14	7	3	3	1	24		
16-17	102		10	0	2	2	1	1	1	0	4		71
18-54	1,047	(178)	107	2	21	21	11	5	5	1	37	(25)	
55-	875		89	1	18	18	9	5	5	1	31		
Cowley													
0-15	9,192		901	428	183	183	91	46	46	9	322		
16-17	1,275		125	56	26	26	13	6	6	1	45		807
18-54	15,184	(2,274)	1,488	615	304	304	76	76	76	15	531	(650)	
55-	9,361		917	264	187	187	94	47	47	9	328		
Crawford													
0-15	8,552		1,326	131	171	171	86	43	43	8	299		
16-17	1,159		180	16	23	23	12	6	6	1	41		716
18-54	17,160	(2,789)	2,660	367	343	343	172	86	86	17	601	(875)	
55-	10,979		1,702	124	220	220	110	55	55	11	384		
Decatur													
0-15	1,403		209	2	28	28	14	7	7	1	49		
16-17	226		34	0	5	5	2	1	1	0	8		158
18-54	1,797	(246)	268	3	36	36	18	9	9	2	63	(25)	
55-	1,562		233	2	31	31	16	8	8	2	55		
Dickinson													
0-15	5,482		532	60	110	110	55	27	27	6	192		
16-17	807		78	7	16	16	8	4	4	1	28		635
18-54	7,923	(975)	769	97	159	159	79	40	40	8	277	(225)	
55-	5,781		561	62	116	116	58	29	29	6	202		
Doniphan													
0-15	2,662		429	89	53	53	27	13	13	3	93		
16-17	336		54	15	7	7	3	2	2	0	12		336
18-54	3,693	(481)	595	134	74	74	37	19	19	4	129	(75)	
55-	2,416		389	102	48	48	24	12	12	2	85		
Douglas													
0-15	13,252		1,193	937	265	265	133	66	66	13	464		
16-17	1,523		137	108	31	31	15	8	8	2	53		954
18-54	35,330	(1,682)	3,180	2,529	707	707	353	177	177	35	1,237	(1,075)	
55-	7,827		704	467	157	157	78	39	39	8	274		
Edwards													
0-15	1,292		71	24	26	26	13	6	6	1	45		
16-17	196		11	1	4	4	2	1	1	0	7		123
18-54	1,717	(267)	94	17	34	34	17	9	9	2	60	(25)	
55-	1,376		76	6	28	28	14	7	7	1	48		
Elk													
0-15	846		137	4	17	17	8	4	4	1	30		
16-17	154		25	2	3	3	2	1	1	0	5		167
18-54	1,273	(230)	206	2	26	26	13	6	6	1	43	(75)	
55-	1,585		257	7	32	32	16	8	8	2	55		
Ellis													
0-15	7,005		722	20	140	140	70	35	35	7	245		
16-17	1,022		105	1	20	20	10	5	5	1	36		510
18-54	12,909	(968)	1,230	99	258	258	129	65	65	13	452	(300)	
55-	3,794		391	8	76	76	38	19	19	4	133		

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Will Not Complete Higher Education
		Academic (25 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Ellsworth													
0-15	1,573		247	9	31	31	16	8	8	2	55		
16-17	251		39	1	5	5	3	1	1	0	9		221
18-54	2,260	(354)	355	6	45	45	23	11	11	2	79	(75)	
55-	2,062		324	10	41	41	21	10	10	2	72		
Finney													
0-15	6,800		626	88	136	136	68	34	34	7	238		
16-17	792		73	14	16	16	8	4	4	1	28		521
18-54	8,421	(967)	775	127	168	168	84	42	42	8	295	(275)	
55-	2,934		270	56	59	59	29	15	15	3	103		
Ford													
0-15	6,978		516	160	140	140	70	35	35	7	244		
16-17	892		66	17	18	18	9	5	5	1	31		573
18-54	10,086	(1,044)	746	179	202	202	101	50	50	10	353	(200)	
55-	4,631		343	64	93	93	46	23	23	5	162		
Franklin													
0-15	5,567		690	112	111	111	56	28	28	6	195		
16-17	686		85	19	14	14	7	3	3	1	24		524
18-54	8,335	(825)	1,034	161	167	167	83	41	41	8	292	(325)	
55-	5,419		672	93	108	108	54	27	27	5	190		
Geary													
0-15	7,316		871	1,335	146	146	73	37	37	7	256		
16-17	887		106	161	18	18	9	4	4	1	31		512
18-54	16,572	(679)	1,972	2,345	331	331	166	83	83	17	580	(350)	
55-	3,336		397	322	67	67	33	17	17	3	117		
Gove													
0-15	1,355		215	1	27	27	14	7	7	1	47		
16-17	167		27	1	3	3	2	1	1	0	6		133
18-54	1,462	(158)	232	2	29	29	15	7	7	2	51	(25)	
55-	956		152	0	19	19	10	5	5	1	34		
Graham													
0-15	1,544		159	49	31	31	15	8	8	2	54		
16-17	229		24	9	5	5	2	1	1	0	8		202
18-54	1,863	(196)	192	45	37	37	19	9	9	2	65	(50)	
55-	1,115		115	51	22	22	11	6	6	1	39		
Grant													
0-15	2,135		203	26	43	43	21	11	11	2	75		
16-17	280		27	0	6	6	3	1	1	0	10		168
18-54	2,711	(284)	258	33	54	54	27	14	14	3	95	(50)	
55-	835		79	3	17	17	8	4	4	1	29		
Gray													
0-15	1,360		126	4	27	27	14	7	7	1	48		
16-17	203		19	1	4	4	2	1	1	0	7		162
18-54	1,866	(266)	174	9	37	37	19	9	9	2	65	(25)	
55-	1,087		101	2	22	22	11	6	6	1	38		
Greeley													
0-15	589		88	5	12	12	5	3	3	1	21		
16-17	92		14	2	2	2	1	1	1	0	3		54
18-54	753	(63)	112	4	15	15	8	4	4	1	26	(25)	
55-	385		57	3	8	8	5	3	3	0	13		
Greenwood													
0-15	2,204		324	6	44	44	22	11	11	2	77		
16-17	359		53	0	7	7	4	2	2	0	15		198
18-54	3,387	(482)	498	22	68	68	34	17	17	3	112	(175)	
55-	3,191		469	8	64	64	32	16	16	3	112		
Hamilton													
0-15	805		106	0	16	16	8	4	4	1	28		
16-17	154		20	0	3	3	2	1	1	0	5		99
18-54	1,096	(104)	145	2	22	22	11	6	6	1	36	(25)	
55-	692		91	2	14	14	7	4	4	1	24		
Harper													
0-15	1,875		199	21	38	38	19	9	9	2	66		
16-17	315		33	0	6	6	3	2	2	0	11		207
18-54	3,023	(405)	320	19	61	61	30	15	15	3	106	(125)	
55-	2,658		282	7	53	53	27	13	13	3	93		

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Will Not Complete Higher Education
		Academic (25 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Harvey													
0-15	7,687		546	171	154	154	77	38	38	8	269		
16-17	1,112		79	18	22	22	11	6	6	1	39		1,043
18-54	12,032	(1,180)	854	247	241	241	120	60	60	12	421	(475)	
55-	6,405		455	119	128	128	64	32	32	6	224		
Haskell													
0-15	1,277		126	12	26	26	13	6	6	1	45		
16-17	174		17	0	4	4	2	1	1	0	6		111
18-54	1,651	(103)	163	5	33	33	17	8	8	2	58	(56)	
55-	570		56	2	11	11	6	3	3	1	20		
Hodgeman													
0-15	840		180	15	17	17	8	4	4	1	29		
16-17	138		30	2	3	3	1	1	1	0	5		82
18-54	1,051	(87)	225	5	21	21	11	5	5	1	37	(25)	
55-	633		135	6	13	13	6	3	3	1	22		
Jackson													
0-15	3,023		366	159	60	60	30	15	15	3	106		
16-17	404		49	19	8	8	4	2	2	0	14		235
18-54	3,952	(359)	478	153	79	79	40	20	20	4	138	(125)	
55-	2,963		359	118	59	59	30	15	15	3	104		
Jefferson													
0-15	3,733		422	45	75	75	37	19	19	4	131		
16-17	490		19	6	10	10	5	3	3	1	17		342
18-54	4,748	(422)	537	53	95	95	48	24	24	5	166	(125)	
55-	2,974		336	44	59	59	30	15	15	3	104		
Jewell													
0-15	1,547		184	6	31	31	15	8	8	2	54		
16-17	272		32	0	5	5	3	1	1	0	10		166
18-54	2,169	(212)	258	6	43	43	22	11	11	2	76	(50)	
55-	2,111		251	2	42	42	21	10	10	2	74		
Johnson													
0-15	73,600		2,134	652	1,472	1,472	736	368	368	74	2,576		
16-17	8,953		260	74	179	179	90	45	45	9	313		5,210
18-54	106,437	(4,339)	3,088	872	2,129	2,129	1,064	532	532	106	3,725	(7,400) ²	
55-	28,672		831	219	573	573	286	143	143	29	1,003		
Kearney													
0-15	1,011		99	13	20	20	10	5	5	1	35		
16-17	156		15	5	3	3	2	1	1	0	6		96
18-54	1,294	(152)	127	11	26	26	13	7	7	1	45	(25)	
55-	586		57	3	12	12	6	3	3	1	21		
Kingman													
0-15	2,624		433	16	52	52	26	13	13	3	92		
16-17	420		69	0	8	8	4	2	2	0	15		265
18-54	3,370	(407)	556	12	67	67	34	17	17	3	118	(150)	
55-	2,472		408	15	49	49	25	13	13	2	87		
Kiowa													
0-15	975		80	2	20	20	10	5	5	1	34		
16-17	214		18	0	4	4	2	1	1	0	8		141
18-54	1,660	(185)	136	2	33	33	17	8	8	2	58	(25)	
55-	1,237		101	1	25	25	12	6	6	1	43		
Labette													
0-15	7,237		977	438	145	145	72	36	36	7	253		
16-17	1,047		141	64	21	21	11	5	5	1	37		552
18-54	10,247	(1,472)	1,383	487	205	205	103	51	51	10	359	(800)	
55-	7,244		978	321	145	145	72	36	36	7	254		
Lane													
0-15	817		100	0	16	16	8	4	4	1	29		
16-17	125		15	0	3	3	1	1	1	0	3		96
18-54	1,108	(106)	136	3	22	22	11	6	6	1	39	(25)	
55-	657		81	3	13	13	7	3	3	1	23		
Leavenworth													
0-15	16,022		1,474	1,359	320	320	160	80	80	16	561		
16-17	1,756		162	138	35	35	18	9	9	2	62		996
18-54	26,237	(3,293)	2,414	3,043	525	525	262	131	131	26	918	(725)	
55-	9,325		858	813	187	187	93	47	47	9	326		

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Will Not Complete Higher Education
		Academic (25 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Lincoln													
0-15	1,084		115	1	22	22	11	5	5	1	37		
16-17	166		18	0	3	3	2	1	1	0	6		123
18-54	1,674	(177)	177	8	34	34	17	8	8	2	59	(25)	
55-	1,658		176	3	33	33	17	8	8	2	58		
Linn													
0-15	1,899		294	7	38	38	19	9	9	2	66		
16-17	312		48	0	6	6	3	2	2	0	11		242
18-54	2,842	(545)	441	20	57	57	28	14	14	3	100	(50)	
55-	2,717		421	30	54	54	27	14	14	3	95		
Logan													
0-15	1,228		126	20	25	25	12	6	6	1	43		
16-17	163		17	3	3	3	2	1	1	0	6		134
18-54	1,535	(184)	158	15	31	31	15	8	8	2	54	(50)	
55-	888		91	17	18	18	9	4	4	1	31		
Lyon													
0-15	7,396		777	206	148	148	74	37	37	7	259		
16-17	963		101	26	19	19	10	5	5	1	34		148
18-54	16,976	(909)	1,782	564	340	340	170	85	85	17	594	(375)	
55-	6,737		707	118	135	135	68	34	34	7	236		
McPherson													
0-15	6,662		453	45	133	133	67	33	33	7	233		
16-17	966		66	6	19	19	10	5	5	1	34		629
18-54	10,931	(1,002)	743	131	219	219	109	55	55	11	383	(275)	
55-	6,219		422	19	124	124	62	31	31	6	218		
Marion													
0-15	3,657		428	39	73	73	37	18	18	4	128		
16-17	567		66	2	11	11	6	3	3	1	20		629
18-54	5,388	(927)	630	35	108	108	54	27	27	5	189	(200)	
55-	4,323		506	9	86	86	43	22	22	5	151		
Marshall													
0-15	3,470		434	3	69	69	35	17	17	4	121		
16-17	522		65	0	10	10	5	3	3	1	18		417
18-54	4,684	(610)	586	10	94	94	47	23	23	5	164	(125)	
55-	4,463		558	10	89	89	45	22	22	5	156		
Meade													
0-15	1,474		205	13	29	29	15	7	7	2	52		
16-17	210		8	1	4	4	2	1	1	0	7		110
18-54	1,985	(265)	276	19	40	40	20	10	10	2	70	(25)	
55-	1,243		173	2	25	25	12	6	6	1	44		
Miami													
0-15	5,554		550	266	111	111	55	28	28	6	194		
16-17	799		79	30	16	16	8	4	4	1	28		603
18-54	7,671	(1,012)	759	271	153	153	77	38	38	8	269	(225)	
55-	5,230		518	145	105	105	53	26	26	5	183		
Mitchell													
0-15	2,191		250	24	44	44	22	11	11	2	77		
16-17	367		42	0	7	7	4	2	2	0	13		223
18-54	2,941	(326)	335	7	59	59	29	15	15	3	103	(75)	
55-	2,511		286	2	50	50	25	13	13	3	88		
Montgomery													
0-15	10,434		1,565	1,066	209	209	104	52	52	10	365		
16-17	1,424		214	104	29	29	14	7	7	1	50		914
18-54	16,159	(2,787)	2,424	1,145	323	323	162	81	81	16	566	(975)	
55-	11,932		1,790	846	239	239	119	60	60	12	418		
Morris													
0-15	1,636		193	6	33	33	16	8	8	2	57		
16-17	245		29	5	5	5	3	1	1	0	9		141
18-54	2,342	(375)	276	9	47	47	23	12	12	2	82	(50)	
55-	2,209		261	21	44	44	22	11	11	2	77		
Morton													
0-15	1,192		97	0	24	24	12	6	6	1	42		
16-17	158		13	0	3	3	2	1	1	0	6		100
18-54	1,636	(116)	133	5	33	33	16	8	8	2	57	(25)	
55-	590		48	3	12	12	6	3	3	1	21		

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Did Not Complete High School
		Academic (15 Years & Over)	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Nemaha													
0-15	3,736		721	24	75	75	37	19	19	4	131		
16-17	517		19	3	10	10	5	3	3	1	18		260
18-54	4,147	(724)	800	25	83	83	42	21	21	4	145	(100)	
55-	3,425		661	21	69	69	34	17	17	3	120		
Neosho													
0-15	5,239		676	132	105	105	52	26	26	5	183		449
16-17	744		96	16	15	15	7	4	4	1	26		
18-54	7,389	(1,095)	953	147	148	148	74	37	37	7	259	(275)	
55-	5,440		702	92	109	109	54	27	27	5	190		
Ness													
0-15	1,339		261	0	27	27	13	7	7	1	47		157
16-17	218		43	0	4	4	2	1	1	0	8		
18-54	1,784	(388)	348	2	36	36	18	9	9	2	62	(25)	
55-	1,450		283	1	29	29	15	7	7	2	51		
Norton													
0-15	1,998		208	13	40	40	20	10	10	2	70		218
16-17	313		33	0	6	6	3	2	2	0	11		
18-54	2,731	(363)	284	17	55	55	27	14	14	3	96	(50)	
55-	2,737		285	3	45	45	22	11	11	2	78		
Osage													
0-15	3,842		492	15	77	77	38	19	19	4	135		313
16-17	515		66	4	10	10	5	3	3	1	18		
18-54	5,176	(785)	663	20	104	104	52	26	26	5	181	(150)	
55-	3,819		489	11	76	76	38	19	19	4	134		
Osborne													
0-15	1,587		176	3	32	32	16	8	8	2	56		130
16-17	286		32	2	6	6	3	1	1	0	10		
18-54	2,246	(360)	249	8	45	45	23	11	11	2	79	(50)	
55-	2,297		255	5	46	46	23	11	11	2	80		
Ottawa													
0-15	1,621		180	0	32	32	16	8	8	2	57		169
16-17	217		24	1	4	4	2	1	1	0	8		
18-54	2,290	(255)	254	3	46	46	23	12	12	2	80	(50)	
55-	2,055		228	8	41	41	21	10	10	2	72		
Pawnee													
0-15	2,066		202	94	41	41	21	10	10	2	72		253
16-17	378		37	14	8	8	4	2	2	0	13		
18-54	3,609	(363)	354	136	72	72	36	18	18	4	126	(50)	
55-	2,431		238	39	49	49	24	12	12	2	85		
Phillips													
0-15	2,189		324	12	44	44	22	11	11	2	77		209
16-17	324		48	5	7	7	3	2	2	0	11		
18-54	3,059	(405)	453	10	61	61	31	15	15	3	107	(50)	
55-	2,316		343	1	46	46	23	12	12	2	81		
Pottawatomie													
0-15	3,381		416	19	68	68	34	17	17	3	118		397
16-17	475		34	3	10	10	5	2	2	0	17		
18-54	4,613	(400)	567	32	92	92	46	23	23	5	162	(125)	
55-	3,286		404	12	66	66	33	16	16	3	115		
Pratt													
0-15	2,628		166	78	53	53	26	13	13	3	92		253
16-17	394		25	10	8	8	4	2	2	0	14		
18-54	4,198	(366)	264	83	84	84	42	21	21	4	147	(150)	
55-	2,836		179	58	57	57	28	14	14	3	99		
Rawlins													
0-15	1,311		202	12	26	26	13	7	7	1	46		143
16-17	229		35	0	5	5	2	1	1	0	8		
18-54	1,653	(206)	255	6	33	33	17	8	8	2	58	(50)	
55-	1,200		185	2	24	24	12	6	6	1	42		
Reno													
0-15	17,806		1,442	563	356	356	178	89	89	18	623		1,440
16-17	2,377		193	62	48	48	24	12	12	0	83		
18-54	26,888	(2,793)	2,178	718	538	538	269	134	134	27	941	(1,450)	
55-	13,694		1,109	257	274	274	137	69	69	14	479		

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Will Not Complete Higher Education
		Academic (15 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Republic													
0-15	2,134		305	2	43	43	21	11	11	2	75		
16-17	293		42	0	6	6	3	2	2	0	10		296
18-54	3,097		443	8	62	62	31	16	16	3	108		
55-	2,974	(397)	425	3	59	59	30	15	15	3	104	(50)	
Rice													
0-15	3,219		251	40	64	64	32	16	16	3	113		
16-17	512		40	5	10	10	5	3	3	1	18		330
18-54	5,039		393	75	101	101	50	25	25	5	176		
55-	3,550	(515)	277	46	71	71	36	18	18	4	124	(150)	
Riley													
0-15	12,037		1,420	1,099	241	241	120	60	60	12	421		
16-17	1,345		159	77	27	27	14	7	7	1	47		695
18-54	37,916		4,474	3,488	758	758	379	190	190	38	1,327		
55-	5,490	(741)	648	129	110	110	55	27	27	6	192	(625)	
Rooks													
0-15	2,253		286	8	45	45	23	11	11	2	79		
16-17	348		44	1	7	7	4	2	2	0	12		236
18-54	2,871		365	9	57	57	29	14	14	3	101		
55-	2,156	(305)	274	8	43	43	22	11	11	2	75	(75)	
Rush													
0-15	1,312		165	0	26	26	13	7	7	1	46		
16-17	224		28	2	5	5	2	1	1	0	8		165
18-54	1,994		251	3	40	40	20	10	10	2	70		
55-	1,587	(289)	200	2	32	32	16	8	8	2	56	(50)	
Russell													
0-15	2,542		272	17	51	51	25	13	13	3	89		
16-17	417		45	13	8	8	4	2	2	0	15		285
18-54	3,787		413	23	76	76	38	19	19	4	133		
55-	2,682	(495)	292	19	54	54	27	13	13	3	94	(75)	
Saline													
0-15	15,354		1,919	1,124	307	307	154	77	77	15	537		
16-17	1,733		217	85	35	35	17	9	9	2	61		991
18-54	20,724		2,591	820	415	415	207	104	104	21	725		
55-	8,781	(1,370)	1,098	196	176	176	88	44	44	9	307	(900)	
Scott													
0-15	1,859		160	18	37	37	19	9	9	2	65		
16-17	262		23	0	5	5	3	1	1	0	9		181
18-54	2,418		208	18	48	48	24	12	12	2	85		
55-	1,067	(242)	92	2	21	21	11	5	5	1	37	(50)	
Sedgwick													
0-15	111,513		8,810	13,547	2,230	2,230	1,115	558	558	112	3,903		
16-17	13,453		1,063	1,269	269	269	135	67	67	14	471		8,165
18-54	169,007		13,352	13,172	3,380	3,380	1,690	845	845	169	5,915		
55-	56,721	(13,555)	4,481	3,131	1,134	1,134	567	284	284	57	1,985	(16,050) 3	
Seward													
0-15	5,329		442	353	107	107	53	27	27	5	187		
16-17	651		54	37	13	13	7	3	3	1	23		449
18-54	7,415		615	283	148	148	74	37	37	7	260		
55-	2,349	(593)	195	58	47	47	23	12	12	2	82	(200)	
Shawnee													
0-15	47,172		3,255	4,690	943	943	472	236	236	47	1,651		
16-17	5,710		394	547	114	114	57	29	29	6	200		3,289
18-54	73,677		5,084	5,580	1,474	1,474	737	368	368	74	2,579		
55-	28,763	(6,031)	1,985	2,133	575	575	288	144	144	29	1,007	(3,050)	
Sheridan													
0-15	1,298		296	1	26	26	13	6	6	1	45		
16-17	217		49	1	4	4	2	1	1	0	8		110
18-54	1,465		334	4	29	29	15	7	7	2	51		
55-	879	(143)	200	0	18	18	9	5	5	1	31	(25)	
Sherman													
0-15	2,458		300	8	49	49	25	12	12	3	86		
16-17	299		36	0	6	6	3	2	2	0	11		204
18-54	3,422		417	12	68	68	34	17	17	3	120		
55-	1,613	(238)	197	2	32	32	16	8	8	2	56	(75)	

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							(Unemployed (Total))	High School Students Who Will Not Complete Higher Education	
		Academic (25 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective			
Smith														
0-15	1,667		228	14	33	33	17	8	8	2	58			
16-17	266		36	0	5	5	3	1	1	0	9			186
18-54	2,451	(276)	336	5	49	49	25	12	12	3	86	(50)		
55-	2,373		325	2	47	47	24	12	12	2	83			
Stafford														
0-15	1,454		105	4	29	29	15	7	7	2	51			
16-17	250		18	1	5	5	3	1	1	0	9			182
18-54	2,192	(206)	158	8	44	44	22	11	11	2	77	(50)		
55-	2,047		147	11	41	41	20	10	10	2	72			
Stanton														
0-15	824		171	24	16	16	8	4	4	1	29			
16-17	105		22	0	2	2	1	1	1	0	4			62
18-54	996	(61)	206	19	20	20	10	5	5	1	35	(25)		
55-	362		75	9	7	7	4	2	2	0	13			
Stevens														
0-15	1,280		115	18	26	26	13	6	6	3	45			
16-17	206		19	6	4	4	2	1	1	0	7			146
18-54	1,907	(152)	172	32	38	38	19	10	10	2	67	(50)		
55-	805		72	17	16	16	8	4	4	1	28			
Sumner														
0-15	6,751		641	96	135	135	68	34	34		236			
16-17	972		92	12	19	19	10				34			611
18-54	9,464	(978)	899	106	189	189	95		47	9	331	(550)		
55-	6,366		605	67	127	127		32	32	6	223			
Thomas														
0-15	2,194		162	6	44	44	22	11	11	2	77			
16-17	288		21	2	6	6	3	1	1	0	10			200
18-54	3,318	(242)	246	15	66	66	33	17	17	3	116	(50)		
55-	1,701		126	3	34	34	17	9	9	2	60			
Trego														
0-15	1,324		193	6	26	26	13	7	7	1	46			
16-17	207		30	0	4	4	2	1	1	0	7			111
18-54	1,654	(242)	241	4	33	33	17	8	8	2	58	(50)		
55-	1,251		183	3	25	25	11	6	6	1	44			
Wabaunsee														
0-15	1,808		239	21	36	36	18	9	9	2	63			
16-17	228		30	3	5	5	2	1	1	0	8			132
18-54	2,381	(317)	314	40	48	48	24	12	12	2	83	(75)		
55-	1,980		261	40	40	40	20	10	10	2	69			
Wallace														
0-15	746		64	20	15	15	7	4	4	1	26			
16-17	104		9	2	2	2	1	1	1	0	4			71
18-54	899	(70)	77	17	18	18	9	5	5	1	32	(25)		
55-	466		40	3	9	9	5	2	2	1	16			
Washington														
0-15	2,466		422	1	49	49	25	12	12	3	86			
16-17	387		66	0	8	8	4	2	2	0	14			351
18-54	3,268	(503)	559	2	65	65	33	16	16	3	114	(75)		
55-	3,128		535	3	63	63	31	16	16	3	109			
Wichita														
0-15	1,204		185	5	24	24	12	6	6	1	42			
16-17	154		24	0	3	3	2	1	1	0	5			98
18-54	1,370	(167)	211	3	27	27	14	7	7	1	48	(25)		
55-	546		84	0	11	11	5	3	3	1	19			
Wilson														
0-15	2,826		514	15	57	57	28	14	14	3	99			
16-17	451		82	4	9	9	5	2	2	1	16			314
18-54	4,247	(637)	773	24	85	85	43	21	21	4	149	(250)		
55-	3,793		690	19	76	76	38	19	19	4	133			

TABLE 61 (continued)
POTENTIAL VOCATIONAL TRAINING STUDENT
POPULATIONS BY COUNTY

COUNTY	POPULATIONS	DISADVANTAGED			HANDICAPPED							Unemployed (Total)**	High School Students Who Will Not Complete Higher Education
		Academic (25 years & over)*	Economic	Cultural	Educable Mentally Retarded	Emotionally and Socially Maladjusted	Learning Disabilities	Other Physically Handicapped	Impaired Hearing and Deaf	Impaired Vision and Blind	Speech Defective		
Woodson													
0-15	1,168		230	13	23	23	12	6	6	1	41		
16-17	179		35	2	4	4	2	1	1	0	6		
18-54	1,719		339	23	34	34	17	9	9	2	60		
55-	1,723	(223)	339	5	34	34	17	9	9	2	60	(75)	96
Wyandotte													
0-15	59,301		5,693	13,719	1,186	1,186	593	297	297	59	2,076		
16-17	7,122		684	1,508	142	142	71	36	36	7	249		
18-54	84,778		8,139	14,952	1,696	1,696	848	424	424	85	2,967		
55-	35,644	(15,142)	3,422	6,790	713	713	356	178	178	36	1,248	(7,400) ⁴	3,837

* Individuals 25 years and older who have not completed the eighth grade.

** Total unemployment regardless of age.

1 Wichita SMSA, including Butler and Sedgwick counties.

2 Kansas City SMSA, including Johnson and Wyandotte counties.

3 Wichita SMSA, including Butler and Sedgwick counties.

4 Kansas City SMSA, including Johnson and Wyandotte counties.

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APPENDICES

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APPENDIX A
LISTING OF COUNTIES

655

A LISTING OF COUNTIES WITH LABOR FORCES OF
LESS THAN 3,000 WORKERS

WESTERN COUNTIES

<u>Name</u>	<u>Work Force</u>
Cheyenne	1375
Clark	1025
Commanche	1050
Decatur	1975
Edwards	1925
Gove	1475
Graham	1800
Grant	2350
Gray	1500
Greeley	700
Hamilton	1150
Haskell	1350
Hodgeman	1000
Kearney	1025
Kiowa	1625
Lane	925
Logan	1400
Meade	1475
Morton	1200
Ness	1750
Rawlins	1550
Rooks	2975
Rush	1850
Scott	1975
Sheridan	1275
Sherman	2825
Stanton	675
Stevens	1550
Thomas	2875
Trego	1825
Wallace	700
Wichita	1150

EASTERN COUNTIES

<u>Name</u>	<u>Work Force</u>
Anderson	2950
Chase	1175
Coffey	2500
Doniphan	2550
Elk	1300
Greenwood	2975
Jackson	2700
Jefferson	2750
Linn	2575
Morris	2325
Wabaunsee	1825
Woodson	1525

APPENDIX B
INTERVIEW INSTRUMENT

657

OCCUPATIONAL TITLES
IN BLS TABLES

COMPARABLE CENSUS
OCCUPATIONAL CATEGORIES

PROFESSIONAL, TECHNICAL AND
KINDRED (CONT)

Surveyors	Same	018
Air traffic controllers	"	019
Radio operators	Radio operator	020
Technicians, other	Technicians, electrical and electronic; techni- cians, other engineering, and physical science; and technicians, other	021
Dentists	Same	022
Dietitians and nutritionists	"	023
Nurses, professional	"	024
Optometrists	"	025
Osteopaths	"	026
Pharmacists	"	027
Physicians and surgeons	"	028
Psychologists	"	029
Technicians, medical and dental	"	030
Veterinarians	"	031
Other medical, health workers	Chiropractors; thera- pists; nurses, student professional	032
Teachers, elementary	Part of college presi- dents, professors, and instructors not classi- fied elsewhere	033
Teachers, secondary	Same	034
Teachers, college	"	035
Teachers, other	"	036
Economists	"	037
Statisticians and actuaries	"	038
Other Social scientists	Miscellaneous social scientists	039
Accountants and auditors	Same	040
Airplane pilots and navigators	"	041
Architects	"	042
Workers in arts and entertainment	Includes actors, artists, and art teachers; athletes; authors; dancers and dance teachers; entertainers, not elsewhere classified; music- ians and music teachers and sports instructors and offi- cials	043

OCCUPATIONAL TITLES
IN BLS TABLES

COMPARABLE CENSUS
OCCUPATIONAL CATEGORIES

PROFESSIONAL, TECHNICAL AND
KINDRED (CONT')

Clergymen	Same	044
Designers, except design draftsmen	"	045
Editors and reporters	"	046
Lawyers and judges	"	047
Librarians	"	048
Personnel and labor relations workers	"	049
Photographers	"	050
Social and welfare workers	"	051
Professional and technical workers, not elsewhere classified	Includes part of college teachers; farm and home management advisors; part of foresters and con- servationists; funeral di- rectors and embalmers; public relations and pub- licity writers; recrea- tion and group workers; religious workers; and professional, technical, and kindred, not else- where classified	052

MANAGERS, OFFICIALS AND
PROPRIETORS

Conductors, railroad	Same	053
Credit men	"	054
Officers, pilots, engineers, ship	Officers, pilots, pursers and engineers, ship	055
Postmasters and assistants	Same	056
Purchasing agents	Purchasing agents and buyers not elsewhere classified	057
Managers, officials and proprietors, not elsewhere classified	Includes buyers and dept. heads, store; buyers and shippers, farm products; floor men and floor mana- gers, store; inspectors, public administration; mana- gers and superintendents, building; officials and admin- istrators, not elsewhere	

OCCUPATIONAL TITLES
IN BLS TABLESCOMPARABLE CENSUS
OCCUPATIONAL CATEGORIESMANAGERS, OFFICIALS AND
PROPRIETORS (CONT)

classified; public administration; officials, lodge, society, union, etc; managers, officials, and proprietors, not elsewhere classified _____ 058

CLERICAL AND KINDRED
WORKERS

Stenos, typists, and secretaries
Office machine operators
Accounting clerks
Bookkeepers, hand
Bank tellers
Cashiers
Mail carriers
Postal clerks
Shipping and receiving clerks
Telephone operators
Clerical and kindred workers
not elsewhere classified

Same
Three separate titles _____ 059
Same _____ 060
Part of bookkeepers _____ 061
Same _____ 062
" _____ 063
" _____ 064
" _____ 065
" _____ 066
" _____ 067
" _____ 068

Includes agents, not elsewhere classified; attendants and assistants, library; attendants, physicians and dental office; baggagemen, transportation; collectors, bill and account dispatchers and starters, vehicles; express messengers and railway mail clerks; file clerks; insurance adjusters, examiners and investigators; messengers and office boys; pay roll and timekeeping clerks; receptionists; stock clerks and store keepers; telegraph messengers; telegraph operators; ticket, station, and express agents; and clerical and kindred not elsewhere classified _____ 069

OCCUPATIONAL TITLES
IN BLS TABLES

COMPARABLE CENSUS
OCCUPATIONAL CATEGORIES

SALES WORKERS	Same	070
CRAFTSMEN, FOREMEN AND KINDRED WORKERS	Same	
Carpenters	"	071
Brickmasons and tile setters	"	072
Cement and concrete finishers	"	073
Electricians	"	074
Excavating, grading machinery operators	"	075
Painters and paperhangers	Painters, construction and maintenance and paperhangers (two titles)	076
Plumbers and pipefitters	Same	077
Plasterers	"	078
Roofers and slaters	"	079
Structural metalworkers	"	080
Foreman, not elsewhere classified	"	081
Machinists and related occupations	Machinists and job set- ters, metal (two titles)	082
Blacksmiths, forge, hammermen	Blacksmiths and forge- men and hammermen (two titles)	083
Boilermakers	Same	084
Heat treaters, annealers	"	085
Millwrights	"	086
Molders, metal (excluding core- makers)	"	087
Patternmakers, metal and wood	"	088
Rollers and roll hands	"	089
Sheet metal workers	Tinsmiths, coppersmiths, and sheet metal workers	090
Toolmakers and diemakers	Toolmakers and diemakers and setters	091
Compositors and typesetters	Same	092
Electrotypers and stereotypes	"	093
Engravers, except photogravers	"	094
Photoengravers and lithographers	"	095
Pressmen and plate printers	"	096
Linemen and servicemen	"	097
Locomotive engineers	"	098
Locomotive firemen	"	099
Airplane mechanics and repairmen	"	100
Motor vehicle mechanics	"	101

OCCUPATIONAL TITLES
IN BLS TABLES

COMPARABLE CENSUS
OCCUPATIONAL CATEGORIES

CRAFTSMEN, FOREMEN AND
KINDRED WORKERS (CONT)

Office machine mechanics	Same	102
Radio and TV mechanics	"	103
Railroad and car shop mechanics	"	104
Other mechanics and repairmen		

Air conditioning, heating,
and refrigeration mechan-
ics, and repairmen and
mechanics and repairmen,
not elsewhere classified
(two titles) _____ 105

Bakers	Same	106
Cabinetmakers	"	107
Craneimen, derrickmen, hoistmen	"	108
Glaziers	"	109
Jewelers and watchmakers	"	110
Loom fixers	"	111
Opticians, lens grinders	"	112
Inspectors, log and lumber	"	113
Inspectors, other	"	114
Upholsterers	"	115

Craftsmen and kindred workers not else-
where classified

Bookbinders, decorators,
and window dressers; fur-
riers; millers, grain, flour,
feed, etc.; motion picture
projectionists; piano and
organ tuners and repairmen;
shoemakers and repairers,
except factory; stationary
engineers, stone cutters and
stone carvers; and craftsmen
and kindred workers, not else-
where classified _____ 116

OPERATIVES AND KINDRED
WORKERS

Drivers, bus, tractor, truck

Deliverymen and routemen

Brakemen and switchmen,
railroad

Bus drivers and truck and
tractor drivers (two titles) _____ 117
Deliverymen and routemen,
and taxicab drivers and
chauffeurs (two titles) _____ 118
Brakemen, railroad and
switchmen (two titles) _____ 119

OCCUPATIONAL TITLES
IN BLS TABLES

COMPARABLE CENSUS
OCCUPATIONAL CATEGORIES

OPERATIVES AND KINDRED
WORKERS (CONT)

Power station operators	Same	120
Sailors and deck hands	"	121
Furnacemen, smelterers, pourers	"	122
Heaters, metal	"	123
Welders and flamecutters	"	124
Assemblers, metalworking, Class A	Part of assemblers	125
Assemblers, metalworking, Class B	Part of assemblers	126
Inspectors, metalworking, Class B	Part of checkers, examiners, and inspectors, manufacturers	127
Machine tool operators, Class B	Part of operatives, not elsewhere classified	128
Electroplaters	Part of operatives, not elsewhere classified	129
Electroplaters helper	Part of operatives, not elsewhere classified	130
Knitters, loopers and toppers	Same	131
Spinners, textile	"	132
Weavers, textile	"	133
Sewers and stitchers, manufacturers	"	134
Asbestos, insulation workers	"	135
Attendants, auto service, parking	"	136
Blasters and powdermen	"	137
Laundry, dry cleaning operatives	"	138
Meat cutters, except meat packing	"	139
Mine operatives, laborers, not elsewhere classified	"	140
Other operatives and kindred workers not elsewhere classified.	Includes apprentices; part of assemblers; boatmen, canalmen, and lock keepers, chainmen, rodmen, and axmen, surveying; part of checkers, examiners, and inspectors, manufacturing; conductors, bus and street railway; dressmakers and seamstresses, except factory; dyers; filers, grinders and polishers, metal; fruit, nut, and vegetable graders and packers, except factory; graders, and	

OCCUPATIONAL TITLES
IN BLS TABLES

COMPARABLE CENSUS
OCCUPATIONAL CATEGORIES

OPERATIVES AND KINDRED
WORKERS (CONT)

sorters, manufacturing;
milliners; motormen, mine,
factory, logging camp, etc.;
motormen, street, subway,
and elevated railway; oilers
and greasers, except auto;
packers and wrappers, not
elsewhere classified; painters,
except construction and
maintenance; photographic
process workers; sawyers,
stationary firemen; part of
operatives and kindred
workers, not elsewhere
classified _____ 141

SERVICE WORKERS

Private household workers

Same _____ 142

Firemen

Firemen, fire protection _____ 143

Guards, watchmen and door-
keepers

Guards, watchmen and
doorkeepers and watch-
men (crossing) and bridge
tenders (two titles) _____ 144

Policemen and other law en-
forcement officials

Marshals and constables;
policemen and detectives;
sheriffs and bailiffs _____ 145

Bartenders

Same _____ 146

Cooks, except private household

" _____ 147

Counter and fountain workers

" _____ 148

Waiters and waitresses

" _____ 149

Airline stewards and stewardesses

Part of housekeepers and
stewards, except private
household _____ 150

Attendants, hospital and other
institutions

Same _____ 151

Charwomen and cleaners

" _____ 152

Janitors and sextons

" _____ 153

Practical nurses

" _____ 154

Other service workers, not
elsewhere classified

Attendants, professional
and personal services, not

OCCUPATIONAL TITLES
IN BLS TABLES

COMPARABLE CENSUS
OCCUPATIONAL CATEGORIES

SERVICE WORKERS (CONT)

elsewhere classified;
attendants recreation and
amusement; barbers;
boarding and lodging house-
keepers; bootblacks; cham-
bermaids and maids, ex-
cept private household;
elevator operators; hair-
dressers and cosmetologists;
part of housekeepers and
stewards, except private
household; kitchen workers,
not elsewhere classified, ex-
cept private household; mid-
wives; porters; ushers, recrea-
tion and amusement; and serv-
ice workers, except private
household, not elsewhere
classified _____ 155

LABORERS, EXCEPT FARM AND
MINE FARMERS AND FARM
WORKERS

Same _____ 156
Farmers and farm mana-
gers, and farm laborers
and foremen _____ 157

APPENDIX C
LISTING OF EMPLOYEES IN HARVEY COUNTY
BY OCCUPATIONAL TITLES

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LISTING OF EMPLOYEES IN HARVEY COUNTY
BY OCCUPATIONAL TITLES
A COMPARISON OF MATRIX PROJECTION WITH ACTUAL SURVEY

OCCUPATIONAL TITLES IN BLS TABLES	PROJECTED BY MATRIX	ACTUAL SURVEY
PROFESSIONAL, TECHNICAL, AND KINDRED		
Engineers, aeronautical	2	0
Engineers, chemical	3	1
Engineers, civil	23	20
Engineers, electrical	13	3
Engineers, industrial	21	5
Engineers, mechanical	31	10
Engineers, metallurgical, etc.	1	5
Engineers, mining	0	0
Other engineers, technical	22	1
Chemists	10	13
Agricultural scientists	2	4
Biological scientists	1	0
Geologists and geophysicists	1	0
Mathematicians	0	0
Physicists	0	0
Other natural scientists	1	0
Draftsmen	29	22
Surveyors	4	3
Air traffic controllers	0	1
Radio operators	2	8
Technicians, other	34	29
Dentists	42	16
Dietitians and nutritionists	10	6
Nurses, professional	247	219
Optometrists	7	3
Osteopaths	4	0
Pharmacists	11	9
Physicians and surgeons	58	31
Psychologists	5	5
Technicians, medical and dental	80	34
Veterinarians	5	2
Other medical, health workers	44	38
Teachers	536	494
Economists	1	0
Statisticians and actuaries	1	0
Other social scientists	0	3
Accountants and auditors	46	21
Airplane pilots and navigators	9	0
Architects	0	0
Workers in arts and entertainment	54	39
Clergymen	36	52
Designers, except design draftsmen	5	5
Editors and reporters	6	19

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OCCUPATIONAL TITLES IN BLS TABLES	PROJECTED BY MATRIX	ACTUAL SURVEY
PROFESSIONAL, TECHNICAL, AND KINDRED (Cont)		
Lawyers and judges	17	20
Librarians	26	18
Personnel and labor relations workers	5	5
Photographers	7	5
Social and welfare workers	12	11
Professional and technical workers, not elsewhere classified	106	76
MANAGERS, OFFICIALS, AND PROPRIETORS		
Conductors, railroad	33	16
Credit men	9	15
Officers, pilots, engineers, ship	0	0
Postmasters and assistants	9	13
Purchasing agents	15	31
Managers, officials, and proprietors, not elsewhere classified	821	707
CLERICAL AND KINDRED WORKERS		
Stenos, typists, and secretaries	345	424
Office machine operators	49	8
Accounting clerks	54	50
Bookkeepers, hand	114	159
Bank tellers	18	55
Cashiers	117	104
Mail carriers	29	24
Postal clerks	25	29
Shipping and receiving clerks	25	24
Telephone operators	45	50
Clerical and kindred workers, not elsewhere classified	638	534
SALES WORKERS	767	547
CRAFTSMEN, FOREMEN, AND KINDRED WORKERS		
Carpenters	125	111
Brickmasons and tile setters	14	4
Cement and concrete finishers	5	1
Electricians	53	29
Excavating, grading machinery operators	31	17
Painters and paperhangers	44	47
Plasterers	2	0
Plumbers and pipefitters	47	23
Roofers and slaters	8	3
Structural metalworkers	18	12
Foremen, not elsewhere classified	265	173
Machinists and related occupations	220	55

OCCUPATIONAL TITLES IN BLS TABLES	PROJECTED BY MATRIX	ACTUAL SURVEY
CRAFTSMEN, FOREMEN, AND KINDRED WORKERS (Cont)		
Blacksmiths, forge, hammermen	9	10
Boilermakers	7	0
Heat treaters, annealers	2	0
Millwrights	7	3
Molders, metal (excluding coremakers)	10	10
Patternmakers, metal and wood	4	2
Rollers and roll hands	0	0
Sheet metal workers	76	50
Toolmakers and diemakers	28	27
Printers	42	42
Linemen and servicemen	8	34
Locomotive engineers	33	16
Locomotive firemen	5	9
Airplane mechanics and repairmen	8	11
Motor vehicle mechanics	108	117
Office machine mechanics	7	0
Radio and TV mechanics	15	17
Railroad and car shop mechanics	28	23
Other mechanics and repairmen	163	122
Bakers	14	13
Cabinetmakers	10	27
Cranemen, derrickmen, hoistmen	18	28
Glaziers	4	4
Jewelers and watchmakers	4	4
Loom fixers	0	0
Opticians, lens grinders	0	1
Inspectors, log and lumber	2	0
Inspectors, other	14	2
Upholsterers	8	5
Craftsmen and kindred workers, not elsewhere classified	83	134
OPERATIVES AND KINDRED WORKERS		
Drivers, bus, truck, tractor	233	222
Deliverymen and routemen	64	47
Brakemen and switchmen, railroad	64	72
Power station operators	0	0
Sailors and deck hands	0	0
Furnacemen, smelterers, pourers	0	0
Heaters, metal	0	1
Welders and flamecutters	194	268
Inspectors, metal working, Class B	23	23
Machine tool operators, Class B	43	167
Electroplaters	2	0
Electroplaters helper	3	0
Knitters, loopers and toppers	0	0

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OCCUPATIONAL TITLES IN BLS TABLES	PROJECTED BY MATRIX	ACTUAL SURVEY
OPERATIVES AND KINDRED WORKERS (Cont)		
Spinners, textile	0	0
Weavers, textile	0	0
Sewers and stitchers, manufacturers	37	35
Asbestos, insulation workers	0	0
Attendants, auto service, parking	105	144
Blasters and powdermen	1	1
Laundry, dry cleaning operatives	50	16
Meat cutters, except meat packing	28	30
Mine operatives, laborers, not elsewhere classified	0	1
Assemblers, metalworking Class A and B, and other operatives and kindred workers, not elsewhere classified	1,204	1,233
SERVICE WORKERS		
Private household workers	0	0
Firemen	22	22
Guards, watchmen and doorkeepers	14	6
Policemen and other law enforcement officials	35	35
Bartenders	15	26
Cooks, except private household	209	232
Counter and fountain workers	42	44
Waiters and waitresses	253	272
Airline stewards and stewardesses	2	0
Attendants, hospital and other institutions	292	338
Charwomen and cleaners	37	67
Janitors and sextons	152	160
Practical nurses	105	35
Other service workers, not elsewhere classified	196	268
LABORERS, EXCEPT FARM AND MINE FARMERS AND FARM WORKERS	430	416
GRAND TOTAL	10,097	9,413

APPENDIX D
K-VIEW USER EVALUATION FORM

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K-VIEW USER EVALUATION FORM

Instructions: Check the appropriate answer.

- school _____ county _____
- A. Male _____ Female _____ Year in School _____
example, 10th grade
- B. How many of the K-VIEW Cards did you read today?
 One _____ Two _____ Three _____ Four or More _____
- C. List by D.O.T. Code K-VIEW job cards read.

- D. On how many occasions, including today have you read the K-VIEW cards?
 Once _____ Twice _____ Three Times _____ Four or more _____
- E. Do you plan to discuss the information on the K-VIEW cards with any of the following?
 Counselor _____ Teacher _____ Parent _____ Others _____
specify
- F. Did you print out a copy of any K-VIEW information?
 Yes _____ No _____ How many copies _____
- G. List by D.O.T. code any print of job card you made from K-VIEW information.

- H. Instructions: Read the three statements below. In the spaces to the right check the appropriate column that most closely gives your personal opinion.

1. The information was helpful.
2. The information was understandable.
3. I would recommend these K-VIEW Cards to another student for use.

Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree

APPENDIX E
K-VIEW APERTURE CARD

KANSAS STATE UNIVERSITY

THE DEPARTMENT OF ADULT
AND OCCUPATIONAL EDUCATION
HOLTON HALL, MANHATTAN, KANSAS
66502 - Phone (913) 532-6184

APPENDIX F
K-VIEW FOB INFORMATION SAMPLE

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KANSAS VOCATIONAL INFORMATION FOR EDUCATION AND WORK

REVISED DATE: 6/72

JOB TITLE : LINEMAN
CODE : 17.1402
D.O.T. : 821.281-010

JOB DESCRIPTION

LINEMEN WITH BOTH TELEPHONE AND ELECTRICAL POWER COMPANIES ARE RESPONSIBLE FOR THE INSTALLATION, EQUIPMENT REPLACEMENT, REPAIRS AND MAINTENANCE OF THE LINES WHICH CARRY TELEPHONE AND POWER SERVICE TO HOMES AND BUSINESSES.



REQUIREMENTS AND QUALIFICATIONS

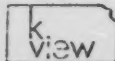
PERSONAL TRAITS GOOD JUDGMENT
CAREFUL WORK HABITS
RESPONSIBILITY
ENJOYMENT OF THE OUT-OF-DOORS

APTITUDES ABILITY TO DO ARITHMETIC QUICKLY AND ACCURATELY

PHYSICAL ABILITIES GOOD GENERAL HEALTH
GOOD EYE-HAND COORDINATION
FULL USE OF ARMS AND FEET AND HANDS
GOOD COLOR PERCEPTION

KANSAS STATE UNIVERSITY
DEPARTMENT OF ADULT AND OCCUPATIONAL EDUCATION

MANHATTAN, KANSAS 66502
HOLTON HALL • PHONE 333-6494



LINEMAN
FOR TOL

PREPARATION AND TRAINING NEEDED

SKILLED LINEMEN USUALLY QUALIFY AFTER ABOUT FOUR TO FIVE YEARS OF ON-THE-JOB TRAINING. IN SOME COUNTRIES, THIS TRAINING CONSISTS OF A FORMAL APPRENTICESHIP PROGRAM. THE WORKER BEGINS AS A GRINDSMAN AND PROGRESSES THROUGH INCREASINGLY DIFFICULT STAGES OF LINEMAN WORK BEFORE BECOMING A SKILLED LINEMAN. HIGH SCHOOL COURSES IN PHYSICS, MATHEMATICS, AND SHOP WORK PROVIDE A TEST OF THE INDIVIDUAL'S INTEREST, ABILITY AND TEMPERAMENT FOR THIS OCCUPATION.



TRAINING PROGRAMS

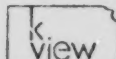
MANHATTAN AREA VOUCH-TECH SCHOOL
414 DICKENS AVENUE
MANHATTAN, KANSAS 66502

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LINEMAN
JOB POST

PROSPECTS AND OPPORTUNITIES

JOB OPPORTUNITIES AND DISTRIBUTION

OPPORTUNITIES FOR LINEMAN EXIST IN THE LIGHT AND POWER AND THE TELEPHONE INDUSTRIES. OPPORTUNITIES ARE NEEDED THROUGHOUT THE STATE PRESENTLY, PROBABLY BEST IN SOME OF THE MORE RURAL AREAS OF THE STATE.

OPPORTUNITIES FOR ADVANCEMENT

A GROUNDMAN WHO HAS THE NECESSARY ABILITIES & INTERESTS CAN BECOME A LINEMAN OR TROUBLEMAN BY MEANS OF ON-THE-JOB TRAINING. LINEMAN WHO HAVE AN EXCELLENT KNOWLEDGE OF THE TECHNICAL PHASES OF THE WORK & SUPERVISORY ABILITY CAN BECOME A CREW CHIEF OR FOREMAN.

JOB AND SALARY INFORMATION

THE HOURS

A 5-DAY, 40-HOUR WORKWEEK, WITH OVERTIME IN THE EVENINGS, NIGHTS, AND WEEKENDS.

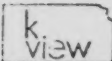
THE PAY

THE SALARY RANGE VARIES FROM \$2.00 TO \$7.30 HOURLY FOR LINEMAN.

BENEFITS

PAID VACATIONS HEALTH INSURANCE
PENSION PLANS
LIFE INSURANCE

KANSAS STATE UNIVERSITY MANHATTAN, KANSAS 66502
DEPARTMENT OF ADULT AND OCCUPATIONAL EDUCATION HOLTON HALL PHONE 533-6484



LINEMAN

LOCAL SOURCES OF INFORMATION

ASK YOUR COUNSELOR: HOW PEOPLE FIND JOBS IN THIS OCCUPATION?
ABOUT DESIRABLE APTITUDE TEST SCORES FOR THIS JOB.

LOCAL STATE EMPLOYMENT SERVICE OFFICE
NEWSPAPER WANT-ADS
OFFICE OF LOCAL POWER & UTILITY COMPANY
COMMUNICATIONS COMPANIES

ADDITIONAL SOURCES OF INFORMATION

EDISON ELECTRIC INSTITUTE, 750 3RD AVE., NEW YORK, N.Y. 10017
INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS, 1200 15TH ST. NW,
WASHINGTON, D. C. 20005
UTILITY WORKERS' UNION OF AMERICA, 1875 CONN. AVE. NW, WASHINGTON, D.C. 20006
COMMUNICATIONS WORKERS OF AMERICA 1925 K ST. NW, WASHINGTON, D. C. 20006
ALLIANCE OF INDEPENDENT TELEPHONE UNIONS, RM 302, 1422 CHESTNUT ST.,
PHILADELPHIA, PA. 19102

RELATED OCCUPATIONS

RELAY-TECHNICIAN JOURNEYMAN (LIGHT, HEAT, POWER) 821.281-018
TROUBLE MAN (LIGHT, HEAT, POWER) 821.281-026
ELECTRIC-METER INSTALLER (LIGHT, HEAT, POWER) 821.381-022

KANSAS STATE UNIVERSITY MANHATTAN, KANSAS 66502
DEPARTMENT OF ADULT AND OCCUPATIONAL EDUCATION • HOLTON HALL • PHONE 537-6984

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APPENDIX G
C. E. 3139 FORM

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DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
OFFICE OF EDUCATION
WASHINGTON, D. C. 20540

OMB NO. 51-200-1
APPROVAL EXPIRES 3/31/73
DATE PREPARED

STATE OUTLYING AREA
FISCAL YEAR ENDING
June 30, 19
REPORT DUE
December 31, 19

SIGNATURE OF STATE DIRECTOR OF VOCATIONAL EDUCATION

PLACEMENT OF PROGRAM COMPLETIONS IN VOCATIONAL EDUCATION PROGRAMS
(Vocational Education Amendments of 1968, P. L. 90-576)

THIS IS A REPORT OF VOCATIONAL EDUCATION PROGRAM COMPLETIONS
AT THE FOLLOWING LEVEL (check one):
☐ SECONDARY ☐ POSTSECONDARY ☐ ADULT EDUCATION

PROGRAM CODE	TITLE	COMPLETIONS	LEFT PRIOR TO NORMAL COMPLETION TIME WITH MARKETABLE SKILLS	STATUS UNKNOWN	NUMBER KNOWN TO BE CONTINUING EDUCATION AT HIGHER LEVEL	NUMBER KNOWN TO HAVE BEEN AVAILABLE FOR PLACEMENT	NUMBER KNOWN TO BE EMPLOYED FULL-TIME IN FIELD TRAINED ON RELATED FIELD	NUMBER KNOWN TO BE UNEMPLOYED
1.	GRAND TOTAL (Unduplicated)							
2.	DISADVANTAGED							
3.	HANDICAPPED							
4.	OCCUPATIONAL & SPECIAL PROGRAMS							
5.	ARTS, CRAFTS, APPRENTICESHIP							
6.	AGRICULTURE							
7.	INDUSTRIAL PRODUCTION							
8.	CONSUMER SERVICE							
9.	MECHANICAL							
10.	INDUSTRY PRODUCTS							
11.	ORNAMENTAL ART							
12.	AGRICULTURAL RESOURCES							
13.	FORESTRY							
14.	OTHER							
15.	TOTAL DISTRIBUTION							
16.	ADVERTISING SERVICES							
17.	APPAREL & ACCESSORIES							
18.	ALTERNATIVE							
19.	FINANCE & CREDIT							
20.	FORESTRY							
21.	GENERAL DISTRIBUTION							
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STATE OUTLYING AREA		PLACEMENT OF PROGRAM COMPLETIONS IN VOCATIONAL EDUCATION PROGRAMS (Cont.)					☐ SECONDARY ☐ POSTSECONDARY ☐ ADULT LEARNING	
PROGRAM	COMPLETIONS	KEY PRIOR TO NORMAL COMPLETION	STATUS UNKNOWN	NUMBER KNOWN TO BE AVAILABLE FOR PLACEMENT	NUMBER KNOWN TO BE CONTINUING EDUCATION AT HIGHER LEVEL	NUMBER KNOWN TO HAVE BEEN EMPLOYED IN FIELD TRAINED OR RELATED FIELD	NUMBER KNOWN TO BE UNEMPLOYED	
CODE	TITLE	(a)	(b)	(c)	(d)	(e)	(f)	
14311	SCIENTIFIC DATA PROCES							
15151	COMMERCIAL PILOT YRG							
15121	RE & SAFETY TECHNOL							
16111	FOOTSTYR TECHNOLOGY							
17111	GRAPHIC TECHNOLOGY							
18111	POLICE SCIENCE							
19111	POLLUTION TECHNOL							
20111	WASTE WATER TECHNOL							
21111	WATER TREATMENT							
22111	TRADES & INDUSTRY							
23111	CONDITIONING							
24111	APPLIANCES REPAIR							
25111	BODY & FENDLER							
26111	MECHANICAL AUTO							
27111	OTHER AUTOMOTIVE							
28111	AIR CONDITIONING							
29111	LEADLINE READING							
30111	BUSINESS MACHINE MAINT							
31111	COMMERCIAL ART OCCUP							
32111	COMMERCIAL FISHING OCCUP							
33111	COMMERCIAL PHOTOGRAPHY OCCUP							
34111	CARPENTRY							
35111	ELECTRICITY							
36111	MAINTENANCE							
37111	PLUMBING & PIPEFITTING							
38111	OTHER CONSTR & MAINT							
39111	GUARDIAL SERVICES							
40111	DIESEL MECHANIC							
41111	DRAFTING OCCUPATIONS							
42111	ELECTRONIC OCCUPATIONS							
43111	ELECTRONIC OCCUPATIONS							
44111	MAINT SERV							

REPLACES OF FORM 3139, 6/70, WHICH IS OBSOLETE

OE FORM 3139, 3/73

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APPENDIX H
PRIVATE SCHOOL COVER LETTER AND INQUIRY FORM

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KANSAS STATE UNIVERSITY

Department of Adult and Occupational Education
College of Education
Holton Hall
Manhattan, Kansas 66506

August 30, 1972

Dear Sir:

Kansas State University is developing a computerized management information system to assist occupational education administrators in planning training programs. To achieve this objective, manpower supply and demand will be matched to determine areas and occupations where training is needed. The results of this matching process will be given to you and other vocational education leaders to assist you in planning your training programs.

All data will be reported on an aggregate basis. In no case will we release separate data on a particular school without the written consent to the owner or manager of that school.

As a prerequisite to providing this information, we need to know the average number of students who graduate from your institution each year by type of training preparation. Please complete and return the enclosed form. This information will become part of the management information system results.

By returning the completed form, your school should realize two important benefits:

1. your school will receive data indicating where additional training is needed, and
2. public and private training programs can be coordinated thus preventing duplication of existing training programs.

Sincerely,

James L. Harris
Assistant Professor

JLH:ab

Enclosure

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SCHOOL _____ ADDRESS _____
 NAME _____ TITLE _____

	TYPE OF TRAINING PROGRAM (Secretary, etc.)	AVERAGE ANNUAL NUMBER OF GRADUATES
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APPENDIX I
SURVEY QUESTIONNAIRE

690

ID. No. _____

PROGRAM TITLE:

1. Number of full-time instructors: _____ (Instructors)
2. Total "shop/laboratory" square feet: _____ (Sq. ft.)
3. Total "classroom" square feet: _____ (Sq. ft.)
4. Program hours spent in "classroom and laboratory" per day _____ (Hrs.)
5. Percent of placement for last graduating class? _____ (Percent)
6. Student "overflow": _____ (Students)
7. Acceptable student capacity (per hour): _____ (Students)
(Maximum work stations available)

8. Starting Time () () Ending Time
(Time) (Time)

Lunch —

Directions: Write in the number of students (head count) in each separate hour of the program.

9. Status of condition of present facilities: _____
A = Top grade B = Desirable C = Satisfactory D = Adequate
E = Poor
10. Do you: own
rent
lease
borrow the program facilities.
11. Do you anticipate expanding this program within the next 5 years:
Yes No
12. If "yes", please justify:
13. Approximate physical facilities expansion cost: \$

APPENDIX J

KANSAS AREA VOCATIONAL-TECHNICAL SCHOOL PROGRAMS

692

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1972-73 DIFFERENTIATED PROGRAM TITLES AT THE FOURTEEN KANSAS AREA VOCATIONAL-TECHNICAL SCHOOLS

<u>Program Title</u>	<u>Area Vocational- Technical School</u>
Accounting - Bookkeeping	Kansas City AVTS
Accounting Technician	Cowley County AVTS
Agribusiness Technology	Cowley County AVTS
Agricultural Science	Liberal AVTS
Agricultural Technology	Southwest Kansas AVTS
Agriculture	Flint Hills AVTS Kaw AVTS
Air Conditioning and Refrigeration	Liberal AVTS Salina AVTS
Aircraft Fabrication	Salina AVTS
Air Frame and Power Mechanics	Wichita AVTS
Appliance Repair - Refrigeration	Kansas City AVTS
Auto Body	Kansas City AVTS Kaw AVTS Northwest Kansas AVTS Salina AVTS Wichita AVTS
Auto Mechanics	(This program exists at all fourteen area vocational- technical schools)
Air Conditioning	Manhattan AVTS Wichita AVTS
Avionics	Wichita AVTS
Basic Electricity/Radio and T.V.	Southwest Kansas AVTS
Body and Fender	Northeast Kansas AVTS
Bricklaying	Liberal AVTS North Central AVTS
Building Construction	Central Kansas AVTS

<u>Program Title</u>	<u>Area Vocational- Technical School</u>
Building Trades	Flint Hills AVTS Kansas City AVTS Manhattan AVTS Northeast Kansas AVTS
Business Education	Manhattan AVTS North Central Kansas AVTS
Business Management	Cowley County AVTS
Carpentry	Cowley County AVTS Kansas City AVTS North Central Kansas AVTS Wichita AVTS
Carpentry and Cabinet Making	Liberal AVTS
Certified Laboratory Assistant	Wichita AVTS
Child Day Care	Wichita AVTS
Civil Technology	Kaw AVTS
Commercial Art	Salina AVTS Wichita AVTS
Communications Technology	Northwest Kansas AVTS
Computer Programming	Wichita AVTS
Cooperative Distributive Education	Central Kansas AVTS
Cooperative Fashion Merchandising	Southwest Kansas AVTS
Cooperative Industrial Training	Central Kansas AVTS Kansas City AVTS Kaw AVTS Manhattan AVTS Wichita AVTS
Cooperative Marketing and Distribution	Southwest Kansas AVTS
Cooperative Occupational Training	Wichita AVTS
Cooperative Office Education	Kaw AVTS Wichita AVTS
Cooperative Retail Selling	Kaw AVTS

<u>Program Title</u>	<u>Area Vocational- Technical School</u>
Copy Design	Wichita AVTS
Cosmetology	Kansas City AVTS Northwest Kansas AVTS Southeast Kansas AVTS Southwest Kansas AVTS
Cycle, Marine, and Small Engine Mechanics	Kaw AVTS
Data Entry Machine Operator and Punch Card	Wichita AVTS
Data Processing	Cowley County AVTS Manhattan AVTS Northwest Kansas AVTS
Dental Assistant	Flint Hills AVTS Wichita AVTS
Dental Hygienist	Wichita AVTS
Diesel Mechanics	Liberal AVTS North Central Kansas AVTS Salina AVTS Wichita AVTS
Dietetic Assistant	Manhattan AVTS
Distributive Education	Central Kansas AVTS Flint Hills AVTS Kansas City AVTS Liberal AVTS Manhattan AVTS Salina AVTS Southeast Kansas AVTS Southwest Kansas AVTS Wichita AVTS
Drafting	Central Kansas AVTS Cowley County AVTS Kansas City AVTS Manhattan AVTS Salina AVTS Southeast Kansas AVTS Wichita AVTS
Drafting Technology	Liberal AVTS
Electric Power and Distribution	Manhattan AVTS

<u>Program Title</u>	<u>Area Vocational- Technical School</u>
Electricity	Central Kansas AVTS Kaw AVTS
Electricity - Electronics	Flint Hills AVTS North Central Kansas AVTS
Electronic Technology	Kansas City AVTS
Engineering Technology	Wichita AVTS
Environmental Water Control	Salina AVTS
Executive Secretary	Southwest Kansas AVTS
Farm Mechanics	North Central Kansas AVTS
Farm and Diesel Mechanics	Northwest Kansas AVTS
Farm and Ranch Management	Southeast Kansas AVTS
Fluid Power	Wichita AVTS
Food Preparation Services	Northeast Kansas AVTS
Food Service	Wichita AVTS
Graphic Arts	Flint Hills AVTS Kansas City AVTS Southeast Kansas AVTS
Heavy Equipment	North Central Kansas AVTS
Home Economics	Liberal AVTS Southwest Kansas AVTS
Home Economics - Clothing Service	Southeast Kansas AVTS
Home Economics - Food Service	Southeast Kansas AVTS
Home Economics - Health	Wichita AVTS
Home Economics Occupations	Wichita AVTS
Horticulture	Wichita AVTS
Industrial Electricity	Northeast Kansas AVTS
Industrial Equipment Mechanic	Kansas City AVTS
Industrial Plastics	Wichita AVTS

<u>Program Title</u>	<u>Area Vocational- Technical School</u>
Industrial Sewing and Drapery Construction	Wichita AVTS
Industrial Skills	Wichita AVTS
Instrumentation Drafting	Liberal AVTS
Instrumentation Technology and Electronic Communications	Liberal AVTS
Learning Skills Center	Flint Hills AVTS
Learning Skills Laboratory	Liberal AVTS
Litho - Printing	Northeast Kansas AVTS
Machine Shop	Central Kansas AVTS Cowley County AVTS Flint Hills AVTS Kansas City AVTS Kaw AVTS Salina AVTS Southeast Kansas AVTS Southwest Kansas AVTS Wichita AVTS
Machine Tool	Wichita AVTS
Medical Assistant	Liberal AVTS
Medical Records and Medical Secretary	Central Kansas AVTS
Medical Secretary	Kaw AVTS
Metal Fabrication	Wichita AVTS
Millwork and Cabinet Making	Wichita AVTS
Office Education	Central Kansas AVTS Cowley County AVTS Flint Hills AVTS Northeast Kansas AVTS Salina AVTS Southeast Kansas AVTS Southwest Kansas AVTS
Office Occupations	Liberal AVTS
Offset Printing	Salina AVTS

Program Title

Area Vocational-
Technical School

Ornamental Horticulture

Central Kansas AVTS
Kaw AVTS

Photography

Kaw AVTS

Plumbing and Pipefitting

Northwest Kansas AVTS

Police Science

Central Kansas AVTS
Cowley County AVTS

Power Mechanics and Metals

Southwest Kansas AVTS

Power Mechanics (Welding -
Marine Mechanics)

Manhattan AVTS

Practical Nursing

Central Kansas AVTS
Flint Hills AVTS
Kansas City AVTS
Manhattan AVTS
North Central Kansas AVTS
Northeast Kansas AVTS
Southeast Kansas AVTS
Southwest Kansas AVTS
Wichita AVTS

Printing

Central Kansas AVTS
Kansas City AVTS
Kaw AVTS
Manhattan AVTS
Wichita AVTS

Production Agriculture

North Central AVTS

Radiology

Central Kansas AVTS

Radio - T.V.

Kaw AVTS

Radio - T.V. Repair

Kansas City AVTS

Restaurant Chef

Kansas City AVTS

Restaurant Management

Central Kansas AVTS

Retailing (Mid-Management
and Management)

Central Kansas AVTS

Secretarial

Central Kansas AVTS
Kansas City AVTS

Secretarial Office Education

Kaw AVTS

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<u>Program Title</u>	<u>Area Vocational- Technical School</u>
Self-Help (A.B.E. and G.E.D.)	Wichita AVTS
Self-Help (Office Occupations)	Wichita AVTS
Self-Help (Trade and Industrial)	Wichita AVTS
Sheet Metal and Design	Flint Hills AVTS
Skills Center	Northeast Kansas AVTS
Special Needs	Salina AVTS
Special Vocations - Home Economics	Wichita AVTS
Special Vocations - Special Education	Wichita AVTS
Special Vocations - Trade and Industrial	Wichita AVTS
Steno - Secretarial and General Clerical	Northwest Kansas AVTS
Technical Drafting	Kaw AVTS Northwest Kansas AVTS
Teleprocessing	Northeast Kansas AVTS
Trade and Industrial - Cooperative	Southeast Kansas AVTS
Trade and Industrial Drafting	Northeast Kansas AVTS
Truck Driving	Southwest Kansas AVTS
Truck Mechanics	Kansas City AVTS
Vocational Agriculture	Central Kansas AVTS Liberal AVTS Southeast Kansas AVTS Southwest Kansas AVTS
Vocational Auto Mechanics	Central Kansas AVTS Southwest Kansas AVTS
Vocational Electricity	Central Kansas AVTS
Vocational Machine Shop	Central Kansas AVTS
Vocational Office Education	Central Kansas AVTS

Program Title

Welding

Area Vocational-
Technical School

Cowley County AVTS

Flint Hills AVTS

Kansas City AVTS

Kaw AVTS

Liberal AVTS

North Central Kansas AVTS

Northeast Kansas AVTS

Salina AVTS

Southwest Kansas AVTS

Wichita AVTS

APPENDIX K
DESCRIPTION OF GENERAL POPULATION AREAS

701

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DISADVANTAGED AND HANDICAPPED POPULATIONS
SERVED BY KANSAS AREA VOCATIONAL-TECHNICAL
SCHOOLS BY COUNTY AND SCHOOL DISTRICTS

Counties and School Districts Served by AVTS	General Population	Academically Disadvantaged	Minority Group	Economically Disadvantaged	Mentally Handicapped	Physically Handicapped
Central Kansas AVTS	112,779	4,975	2,356	8,540	5,640	5,186
Harvey County	27,236	1,180	555	1,934	1,362	1,252
#369 Burrton						
#460 Hesston						
#373 Newton						
#439 Sedgwick						
McPherson County	24,778	1,002	201	1,684	1,238	1,141
#419 Canton-Galva						
#448 Inman						
#400 Lindsborg						
#418 McPherson						
Reno County	60,765	2,793	1,600	4,922	3,040	2,793
#308 Hutchinson						
#311 Partridge						
#310 Reno County						
Cowley County AVTS	58,565	3,252	1,644	5,668	2,917	2,693
Sumner County	23,553	978	281	2,237	1,177	1,083
#356 Conway Springs						
#353 Wellington						
Cowley County	35,012	2,274	1,363	3,431	1,740	1,610

(Table Continued)

Counties and School Districts Served by AVTS	General Population	Academically Disadvantaged	Minority Group	Economically Disadvantaged	Mentally Handicapped	Physically Handicapped
#470 Arkansas City						
#462 Burden-Cambridge						
#471 Dexter						
#463 Udall						
#465 Winfield						
Flint Hills AVTS	58,556	2,602	1,097	6,908	3,059	2,816
Chase County	3,408	284	62	567	299	275
#214 Burlington						
Greenwood County	9,141	482	36	1,344	458	421
#390 Hamilton						
#386 Madison						
Lyon County	32,072	909	914	3,367	1,284	1,638
# Emporia						
Marion County	13,935	927	85	1,630	696	643
#411 Council Grove						
#408 Marion						
Kansas City AVTS	404,507	19,481	38,786	24,251	20,224	18,411
Wyandotte County	186,845	15,142	36,969	17,938	9,342	8,410
#500 Sumner						
#202 Turner						
#500 Wyandotte						
Johnson County	217,662	4,339	1,817	6,313	10,882	10,001
#512 USD						
Kaw AVTS	177,609	6,812	13,547	13,284	8,880	8,176
Jackson County	10,342	359	449	1,252	412	218
#336 Holton	703	714				

(Table Continued)

Counties and School Districts Served by AVTS	General Population	Academically Disadvantaged	Minority Group	Economically Disadvantaged	Mentally Handicapped	Physically Handicapped
Jefferson County	11,945	422	148	1,314	598	553
#338 Valley Falls						
Shawnee County	155,322	6,031	12,950	10,718	7,766	7,147
#345 Seaman						
#450 Shawnee Heights						
#501 Topeka						
#437 Washburn Rural						
Liberal AVTS	26,730	1,058	812	2,294	1,340	1,234
Comanche County	2,702	128	3	275	138	127
#300 Coldwater						
Kiowa County	4,086	185	5	335	205	187
#422 Greensburg						
#474 Haviland						
#424 Mullinville						
Seward County	15,744	593	731	1,306	787	725
#480 Liberal						
Stevens County	4,198	152	73	378	210	195
#210 Hugoton						
Manhattan AVTS	56,788	741	4,793	6,701	2,840	2,612
Riley County	56,788	741	4,793	6,701	2,840	2,612
#383 Manhattan						
North Central Kansas AVTS	26,319	1,020	85	3,093	1,316	1,210

(Table Continued)

Counties and School Districts Served by AVTS	General Population	Academically Disadvantaged	Minority Group	Economically Disadvantaged	Mentally Handicapped	Physically Handicapped
Jewell County	6,099	212	14	725	303	280
#279 Jewell						
Lincoln County	4,582	177	12	486	231	209
#299 Sylvan Grove						
Mitchell County	8,010	326	33	913	400	371
#273 Beloit						
#272 Cawker City						
Rooks County	7,628	305	26	969	382	350
#270 Plainville						
Northeast Kansas AVTS	93,297	5,214	7,496	18,406	4,667	4,291
Atchison County	19,165	869	1,273	2,548	958	881
#409 Atchison						
#377 Effingham						
Brown County	11,685	571	530	1,987	581	536
#430 Horton						
Doniphan County	9,107	481	340	1,467	455	420
#425 Highland						
Leavenworth County	53,340	3,293	4,908	5,353	2,667	2,352
Northwest Kansas AVTS	64,103	3,223	394	8,840	3,396	3,118
Cheyenne County	4,256	419	3	485	213	198
#296 Bird City						
#297 St. Francis						

705

(Table Continued)

Counties and School Districts Served by AVTS	General Population	Academically Disadvantaged	Minority Group	Economically Disadvantaged	Mentally Handicapped	Physically Handicapped
Decatur County	4,988	419	7	744	250	230
#295 Jennings						
#294 Oberlin						
Greeley County	1,819	63	14	271	95	87
#200 Tribune						
Gove County	3,940	158	4	626	197	182
#293 Quinter						
Graham County	4,751	196	154	490	237	219
#281 Hill City						
Hamilton County	2,747	104	4	362	138	128
#478 Icendall						
#494 Syracuse						
Logan County	3,814	184	55	392	192	176
#274 Oakley						
Ness County	4,791	388	3	935	240	221
#301 Utica						
Norton County	7,779	363	33	810	384	336
#213 Lenora						
Sherman County	7,792	238	22	950	388	359
#385 Edson						
#352 Goodland						
#412 Hoxie						

(Table Continued)

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Counties and School Districts Served by AVTS	General Population	Academically Disadvantaged	Minority Group	Economically Disadvantaged	Mentally Handicapped	Physically Handicapped
Thomas County	7,501	242	26	555	375	246
#314 Brewster						
#315 Colby						
#316 Oxford						
Trego County	4,436	242	13	647	221	203
#208 Wakeeney						
Wallace County	2,215	70	42	190	110	105
#241 Sharon Springs						
#242 Weskan						
Wichita County	3,274	167	8	504	163	151
#467 Leoti						
Salina AVTS	103,692	3,956	2,690	11,100	5,187	4,772
Dickinson County	19,993	975	226	1,940	1,002	920
#393 Solomon						
Ellsworth County	6,146	354	26	965	307	281
#327 Ellsworth						
McPherson County	24,778	1,002	201	1,684	1,238	1,141
#400 Lindsborg						
Ottawa County	6,183	255	12	686	308	285
#240 Bennington						
#239 Minneapolis						
#240 Tescott						
Saline County	46,592	1,370	2,255	5,825	2,332	2,145

(Table Continued)

Counties and School Districts Served by AVTS	General Population	Academically Disadvantaged	Minority Group	Economically Disadvantaged	Mentally Handicapped	Physically Handicapped
#305 USD						
#306 USD						
Southeast Kansas AVTS	69,998	4,908	3,671	11,839	3,504	3,125
Chautaugua County	4,642	320	79	1,041	232	214
#286 Sedan						
Cherokee County	21,549	1,571	416	4,180	1,078	903
#493 Columbus						
Elk County	3,858	230	15	625	195	178
#282 Howard						
Montgomery County	39,949	2,787	3,161	5,993	1,999	1,838
#436 Caney						
#445 Coffeyville						
Southwest Kansas AVTS	22,587	1,044	420	1,671	1,132	1,039
Ford County	22,587	1,044	420	1,671	1,132	1,039
#443 Dodge City						
Wichita AVTS	350,694	13,555	31,119	27,706	17,533	16,134
Sedgwick County	350,694	13,555	31,119	27,706	17,533	16,134
#259 USD						

APPENDIX L
LISTING OF COMPUTER PROGRAM

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IDENTIFICATION DIVISION.

PROGRAM-ID. PhD-DISSERTATION-PGM.

AUTHOR. DAVID L JONES.

INSTALLATION. KANSAS STATE UNIVERSITY.

REMARKS. THIS PROGRAM PRODUCES A LISTING OF CHI SQUARE
REJECTIONS OR RETAINMENTS FOR EACH OF THE 15
HYPOTHESES IN MR. JONES' DISSERTATION.

ENVIRONMENT DIVISION.

CONFIGURATION SECTION.

SOURCE-COMPUTER. IBM-360-H50.

OBJECT-COMPUTER. IBM-360-H50.

INPUT-OUTPUT SECTION.

FILE-CONTROL.

SELECT INPUT-FILE ASSIGN TO UT-S-TAPEIN.

SELECT SCHOOL-FILE ASSIGN TO UT-S-SYSIN1.

SELECT PROGRAM-FILE ASSIGN TO UT-S-SYSIN2.

SELECT HEAD-FILE ASSIGN TO UT-S-SYSIN3.

SELECT PRINT-FILE ASSIGN TO UT-S-SYSPRINT.

DATA DIVISION.

FILE SECTION.

FD INPUT-FILE

RECORDING MODE IS F

RECORD CONTAINS 131 CHARACTERS

BLOCK CONTAINS 55 RECORDS

LABEL RECORDS ARE STANDARD

DATA RECORD IS INPUT-REC.

01 INPUT-REC PICTURE X(131).

FD SCHOOL-FILE

RECORDING MODE IS F

RECORD CONTAINS 80 CHARACTERS

LABEL RECORDS ARE OMITTED

DATA RECORD IS SCH-REC.

01 SCH-REC PICTURE X(80).

FD PROGRAM-FILE

RECORDING MODE IS F

RECORD CONTAINS 80 CHARACTERS

LABEL RECORDS ARE OMITTED

DATA RECORD IS PRO-REC.

01 PRO-REC PICTURE X(80).

FD PRINT-FILE

RECORDING MODE IS F

RECORD CONTAINS 133 CHARACTERS

LABEL RECORDS ARE OMITTED

DATA RECORD IS P-LINE.

01 P-LINE PICTURE X(133).

FD HEAD-FILE

RECORDING MODE IS F

RECORD CONTAINS 80 CHARACTERS

LABEL RECORDS ARE OMITTED

DATA RECORD IS CARD-IN.

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01 CARD-IN PICTURE X(80).
WORKING-STORAGE SECTION.
01 VARIABLE-AREA.
    02 A PICTURE S999 VALUE 1.
    02 B PICTURE S999 VALUE 1.
    02 I PICTURE S999 VALUE 1.
    02 J PICTURE S999 VALUE 1.
    02 K PICTURE S9999999 VALUE 0.
    02 L PICTURE S999 VALUE 1.
    02 R PICTURE S999 VALUE 1.
    02 N PICTURE S999999 VALUE ZEROES.
    02 P PICTURE S999 VALUE ZEROES.
    02 Q PICTURE S999 VALUE 1.
    02 TME PICTURE S9(8).
    02 TMP PICTURE S9(8).
    02 SUM-HOLD PICTURE S9(7)V99.
    02 LINE-COUNT PICTURE S99 VALUE ZEROES.
    02 PCT-DIS-HAN PICTURE S9V99.
    02 NO-COLUMNS PICTURE S999 VALUE ZEROES.
    02 CALCULATED-CHI PICTURE S999999V99 VALUE ZEROES.
    02 TABULAR-CHI PICTURE S999999V99.
    02 ROW-NAME-1 PICTURE X(10).
    02 ROW-NAME-2 PICTURE X(10).
01 TABLE-AREA.
    02 SCHOOL OCCURS 14 TIMES.
        03 PROGRAM-TYPE OCCURS 200 TIMES.
            04 ACA-DIS PICTURE 9999.
            04 NON-WHITE PICTURE 9999.
            04 ECO-DIS PICTURE 9999.
            04 PHY-HAN PICTURE 9999.
            04 MEN-HAN PICTURE 9999.
            04 TOTAL-DIS-HAN PICTURE 9999.
            04 TOTAL-FNR PICTURE 9999.
    02 SCHOOL-CODE OCCURS 14 TIMES.
        03 SCH-CODE PICTURE X(6).
        03 GEN-POP PICTURE 9(6).
        03 GEN-ACA PICTURE 9(6).
        03 GEN-NW PICTURE 9(6).
        03 GEN-ECO PICTURE 9(6).
        03 GEN-MEN PICTURE 9(6).
        03 GEN-PHY PICTURE 9(6).
    02 PROGRAM-CODE OCCURS 200 TIMES.
        03 PRO-CODE PICTURE X(4).
        03 CHI-VALUES PICTURE 999V99.
    02 ROW-CELL-ACTUAL OCCURS 2 TIMES.
        03 COLUMN-CELL-ACTUAL OCCURS 200 TIMES.
            04 ACTUAL-CELL PICTURE 9(6).
    02 ROW-CELL-EXPECTED OCCURS 2 TIMES.
        03 COLUMN-CELL-EXPECTED OCCURS 200 TIMES.
            04 EXPECTED-CELL PICTURE 9(6)V9999.
    02 ROW-TOTALS OCCURS 2 TIMES.
        03 ROW-TOTAL PICTURE 9(8)V99.
    02 COLUMN-TOTALS OCCURS 200 TIMES.
        03 COLUMN-TOTAL PICTURE 9(8)V99.

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02 CHI-HEADER OCCURS 40 TIMES.
  03 CX PICTURE X(26).
  03 HEAD-AREAS OCCURS 5 TIMES.
    04 HD-APEA PICTURE X(10).
02 CHI-LINE-1 OCCURS 40 TIMES.
  03 CY PICTURE X(16).
  03 HEAD-1-LINE PICTURE X(10).
  03 DATA-AREAS OCCURS 5 TIMES.
    04 ACT-OUT-1 PICTURE X(10).
02 CHI-LINE-2 OCCURS 40 TIMES.
  03 CZ PICTURE X(16).
  03 HEAD-2-LINE PICTURE X(10).
  03 DATA-AREAS OCCURS 5 TIMES.
    04 ACT-OUT-2 PICTURE X(10).
02 HEAD OCCURS 15 TIMES.
  03 CC PICTURE X(16).
  03 OTHER-DATA PICTURE X(60).
01 INPUT-AREA.
  02 FILLER PICTURE X(74).
  02 RACE PICTURE X.
  02 FILLER PICTURE X(8).
  02 SCH-CODE-IN PICTURE X(6).
  02 FILLER PICTURE X(3).
  02 PRG-CODE-IN PICTURE X(4).
  02 FILLER PICTURE X(16).
  02 S PICTURE X.
  02 T PICTURE X.
  02 U PICTURE X.
  02 V PICTURE X.
  02 FILLER PICTURE X(15).
01 OUTPUT-AREAS.
  02 MAJOR-HEADER.
    03 CC PICTURE X(24) VALUE SPACES.
    03 TITLE-1 PICTURE X(45) VALUE
      'SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA'.
  02 HEAD-2.
    03 CC PICTURE X(38) VALUE SPACES.
    03 TITLE-2 PICTURE X(16) VALUE
      'RAW DATA SUMMARY'.
  02 VARIABLE-HEADER PICTURE X(80).
  02 DISPOSITION-LINE.
    03 CC PICTURE X(16) VALUE SPACES.
    03 P1 PICTURE X(11) VALUE 'HYPOTHESIS '.
    03 STATUS1 PICTURE X(8).
    03 P2 PICTURE X(12) VALUE '; TAB CHI = '.
    03 TAB-CHI PICTURE ZZZZ.99.
    03 TAB-CHI-CHR REDEFINES TAB-CHI PICTURE X(8).
    03 P3 PICTURE X(13) VALUE '; COMP CHI = '.
    03 COM-CHI PICTURE ZZZZ.99.
    03 COM-CHI-CHR REDEFINES COM-CHI PICTURE X(8).
  02 RAW-DATA-COLUMN-HEADS.
    03 CC PICTURE X(19) VALUE SPACES.
    03 P1 PICTURE X(20) VALUE
      'SCH          PROG          A'.

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03 P2                PICTURE X(37) VALUE
      'CA CUL ECO MEN PHY TOT ENR PCT'.
02 RAW-DATA-OUTPUT-LINE.
03 CC                PICTURE X(16) VALUE SPACES.
03 SCHOOL-OUT        PICTURE X(13).
03 PROGRAM-OUT       PICTURE X(8).
03 ACA               PICTURE ZZZZ.
03 FILLER            PICTURE X VALUE SPACES.
03 CUL               PICTURE ZZZZ.
03 FILLER            PICTURE X VALUE SPACES.
03 ECO               PICTURE ZZZZ.
03 FILLER            PICTURE X VALUE SPACES.
03 MEN               PICTURE ZZZZ.
03 FILLER            PICTURE X VALUE SPACES.
03 PHY               PICTURE ZZZZ.
03 FILLER            PICTURE X VALUE SPACES.
03 TOT               PICTURE ZZZZ.
03 FILLER            PICTURE X VALUE SPACES.
03 ENR               PICTURE ZZZZ.
03 FILLER            PICTURE X VALUE SPACES.
03 PCT               PICTURE Z.99.

02 DF-LINE.
03 CC                PICTURE X(16) VALUE SPACES.
03 XXX               PICTURE X(21) VALUE 'DEGREES OF FREEDOM = '.
03 DF               PICTURE ZZZ.

02 CONTRL-LINE.
03 CC                PICTURE X(36) VALUE SPACES.
03 CENTER-PGM        PICTURE X(15) VALUE
      'PROGRAM CODE = '.
03 CONTRL            PICTURE XXXX VALUE SPACES.

PROCEDURE DIVISION.
MAIN-LINE SECTION.
NOTE-PARAGRAPH.

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NOTE:

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*
* THIS SECTION CONTROLS THE PROGRAM AND SETS UP
* TABLES FOR CHI SQUARE CALCULATIONS. THE FIRST
* THREE PARAGRAPHS PERFORM STANDARD HOUSEKEEPING
* FUNCTIONS; I.E., OPEN FILES AND CALL READ AND
* INITIALIZING SECTIONS. THE FOURTH PARAGRAPH
* CALLS THE SECTION WHICH DUMPS RAW DATA FOR
* CHECKING PURPOSES. THE NEXT FIVE PARAGRAPHS
* COMPUTE 70 CHI'S ANALYZING THE RELATIONSHIPS
* BETWEEN 14 SCHOOL POPULATIONS AND THE GENERAL
* POPULATION RELATIVE TO FIVE HANDICAPS OR DIS-
* ADVANTAGES. THE NEXT FIVE PARAGRAPHS COMPUTE
* FIVE CHIS ANALYZING THE RELATIONSHIPS BETWEEN
* PROGRAM-TYPES RELATIVE TO SERVICE TO FIVE HAN-
* DICAPPED OR DISADVANTAGED GROUPS. THE NEXT FIVE
* PARAGRAPHS COMPUTE CHI'S ANALYZING THE RELATION-
* SHIPS BETWEEN ALL PROGRAMS AND FIVE HANDICAPS
* OR DISADVANTAGES RELATIVE TO PROGRAMS BY
* SCHOOL. THE FINAL PARAGRAPH SHUTS DOWN PROGRAM
*
*****

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OPEN-FILES.

OPEN INPUT INPUT-FILE, SCHOOL-FILE, PROGRAM-FILE, HEAD-FILE;
OUTPUT PRINT-FILE.

INITIALIZE-TABLES-AND-VARIABLE.

PERFORM INITIALIZING.

READ-DATA-INTO-TABLES.

PERFORM READ-DATA.

PRINT-RAW-DATA.

PERFORM RAW-DATA-PRINT.

COMPUTE-HYP-1.

ADD ACA-DIS (A, J) TO ACTUAL-CELL (2, 2).

ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, 2).

ADD 1 TO J.

IF J < 201 GO TO COMPUTE-HYP-1.

MOVE GEN-ACA (A) TO ACTUAL-CELL (2, 1).

MOVE GEN-POP (A) TO ACTUAL-CELL (1, 1).

MOVE HEAD (R) TO VARIABLE-HEADER.

MOVE 'NOT A-D' TO ROW-NAME-1.

MOVE 'A-D' TO ROW-NAME-2.

SUBTRACT ACTUAL-CELL (2, 2) FROM ACTUAL-CELL (1, 2).

SUBTRACT ACTUAL-CELL (2, 1) FROM ACTUAL-CELL (1, 1).

MOVE SCH-CODE (A) TO HD-AREA (1, 2).

MOVE 'GEN POP' TO HD-AREA (1, 1).

MOVE 1 TO J.

PERFORM COMPUTE-CHI.

IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-1.

MOVE 1 TO A.

ADD 1 TO R.

COMPUTE-HYP-2.

ADD NON-WHITE (A, J) TO ACTUAL-CELL (2, 2).

ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, 2).

ADD 1 TO J.

IF J < 201 GO TO COMPUTE-HYP-2.

MOVE GEN-NW (A) TO ACTUAL-CELL (2, 1).

MOVE GEN-POP (A) TO ACTUAL-CELL (1, 1).

MOVE HEAD (R) TO VARIABLE-HEADER.

MOVE 'NOT C-D' TO ROW-NAME-1.

MOVE 'C-D' TO ROW-NAME-2.

SUBTRACT ACTUAL-CELL (2, 2) FROM ACTUAL-CELL (1, 2).

SUBTRACT ACTUAL-CELL (2, 1) FROM ACTUAL-CELL (1, 1).

MOVE SCH-CODE (A) TO HD-AREA (1, 2).

MOVE 'GEN POP' TO HD-AREA (1, 1).

MOVE 1 TO J.

PERFORM COMPUTE-CHI.

IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-2.

MOVE 1 TO A.

ADD 1 TO R.

COMPUTE-HYP-3.

ADD ECO-DIS (A, J) TO ACTUAL-CELL (2, 2).

ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, 2).

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ADD 1 TO J.
IF J < 201 GO TO COMPUTE-HYP-3.
MOVE GEN-ECG (A) TO ACTUAL-CELL (2, 1).
MOVE GEN-POP (A) TO ACTUAL-CELL (1, 1).
MOVE HEAD (R) TO VARIABLE-HEADER.
MOVE 'NOT E-D' TO ROW-NAME-1.
MOVE 'E-D' TO ROW-NAME-2.
SUBTRACT ACTUAL-CELL (2, 2) FROM ACTUAL-CELL (1, 2).
SUBTRACT ACTUAL-CELL (2, 1) FROM ACTUAL-CELL (1, 1).
MOVE SCH-CODE (A) TO HD-AREA (1, 2).
MOVE 'GEN POP' TO HD-AREA (1, 1).
MOVE 1 TO J.
PERFORM COMPUTE-CHI.
IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-3.
MOVE 1 TO A.
ADD 1 TO R.
COMPUTE-HYP-4.
ADD MEN-HAN (A, J) TO ACTUAL-CELL (2, 2).
ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, 2).
ADD 1 TO J.
IF J < 201 GO TO COMPUTE-HYP-4.
MOVE GEN-MEN (A) TO ACTUAL-CELL (2, 1).
MOVE GEN-POP (A) TO ACTUAL-CELL (1, 1).
MOVE HEAD (R) TO VARIABLE-HEADER.
MOVE 'NOT M-H' TO ROW-NAME-1.
MOVE 'M-H' TO ROW-NAME-2.
SUBTRACT ACTUAL-CELL (2, 2) FROM ACTUAL-CELL (1, 2).
SUBTRACT ACTUAL-CELL (2, 1) FROM ACTUAL-CELL (1, 1).
MOVE SCH-CODE (A) TO HD-AREA (1, 2).
MOVE 'GEN POP' TO HD-AREA (1, 1).
MOVE 1 TO J.
PERFORM COMPUTE-CHI.
IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-4.
MOVE 1 TO A.
ADD 1 TO R.
COMPUTE-HYP-5.
ADD PHY-HAN (A, J) TO ACTUAL-CELL (2, 2).
ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, 2).
ADD 1 TO J.
IF J < 201 GO TO COMPUTE-HYP-5.
MOVE GEN-PHY (A) TO ACTUAL-CELL (2, 1).
MOVE GEN-POP (A) TO ACTUAL-CELL (1, 1).
MOVE HEAD (R) TO VARIABLE-HEADER.
MOVE 'NOT P-H' TO ROW-NAME-1.
MOVE 'P-H' TO ROW-NAME-2.
SUBTRACT ACTUAL-CELL (2, 2) FROM ACTUAL-CELL (1, 2).
SUBTRACT ACTUAL-CELL (2, 1) FROM ACTUAL-CELL (1, 1).
MOVE SCH-CODE (A) TO HD-AREA (1, 2).
MOVE 'GEN POP' TO HD-AREA (1, 1).
MOVE 1 TO J.
PERFORM COMPUTE-CHI.
IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-5.
MOVE 1 TO A.
ADD 1 TO R.

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COMPUTE-HYP-6.

MOVE '0100' TO HD-AREA (1, 1).
 ADD ACA-DIS (A, J) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, Q).
 SUBTRACT ACA-DIS (A, J) FROM ACTUAL-CELL (1, Q).
 IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-6.
 MOVE 1 TO A.
 ADD 1 TO J.
 IF ACTUAL-CELL (1, Q) > 0 ADD 1 TO Q GO TO CONT-6.
 IF ACTUAL-CELL (2, Q) > 0 ADD 1 TO Q.

CONT-6.

COMPUTE B = Q / 5.0001 + 1.
 COMPUTE TMP = Q - (B - 1) * 5.
 MOVE PRO-CODE (J) TO HD-AREA (8, TMP).
 IF J < 201 GO TO COMPUTE-HYP-6.
 MOVE 1 TO J.
 MOVE 'NOT A-D' TO ROW-NAME-1.
 MOVE 'A-D' TO ROW-NAME-2.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 PERFORM COMPUTE-CHI.
 MOVE 1 TO Q.
 ADD 1 TO R.

COMPUTE-HYP-7.

MOVE '0100' TO HD-AREA (1, 1).
 ADD NON-WHITE (A, J) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, Q).
 SUBTRACT NON-WHITE (A, J) FROM ACTUAL-CELL (1, Q).
 IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-7.
 MOVE 1 TO A.
 ADD 1 TO J.
 IF ACTUAL-CELL (1, Q) > 0 ADD 1 TO Q GO TO CONT-7.
 IF ACTUAL-CELL (2, Q) > 0 ADD 1 TO Q.

CONT-7.

COMPUTE B = Q / 5.0001 + 1.
 COMPUTE TMP = Q - (B - 1) * 5.
 MOVE PRO-CODE (J) TO HD-AREA (8, TMP).
 IF J < 201 GO TO COMPUTE-HYP-7.
 MOVE 1 TO J.
 MOVE 'NOT N-W' TO ROW-NAME-1.
 MOVE 'N-W' TO ROW-NAME-2.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 PERFORM COMPUTE-CHI.
 MOVE 1 TO Q.
 ADD 1 TO R.

COMPUTE-HYP-8.

MOVE '0100' TO HD-AREA (1, 1).
 ADD ECO-DIS (A, J) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, Q).
 SUBTRACT ECO-DIS (A, J) FROM ACTUAL-CELL (1, Q).
 IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-8.
 MOVE 1 TO A.
 ADD 1 TO J.
 IF ACTUAL-CELL (1, Q) > 0 ADD 1 TO Q GO TO CONT-8.
 IF ACTUAL-CELL (2, Q) > 0 ADD 1 TO Q.

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CONT-8.

COMPUTE B = Q / 5.0001 + 1.
 COMPUTE TMP = Q - (B - 1) * 5.
 MOVE PRO-CODE (J) TO HD-AREA (B, TMP).
 IF J < 201 GO TO COMPUTE-HYP-8.
 MOVE 1 TO J.
 MOVE 'NOT E-D' TO ROW-NAME-1.
 MOVE 'E-D' TO ROW-NAME-2.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 PERFORM COMPUTE-CHI.
 MOVE 1 TO Q.
 ADD 1 TO R.

COMPUTE-HYP-9.

MOVE '0100' TO HD-AREA (1, 1).
 ADD MEN-HAN (A, J) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, Q).
 SUBTRACT MEN-HAN (A, J) FROM ACTUAL-CELL (1, Q).
 IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-9.
 MOVE 1 TO A.
 ADD 1 TO J.
 IF ACTUAL-CELL (1, Q) > 0 ADD 1 TO Q GO TO CONT-9.
 IF ACTUAL-CELL (2, Q) > 0 ADD 1 TO Q.

CONT-9.

COMPUTE R = Q / 5.0001 + 1.
 COMPUTE TMP = Q - (R - 1) * 5.
 MOVE PRO-CODE (J) TO HD-AREA (B, TMP).
 IF J < 201 GO TO COMPUTE-HYP-9.
 MOVE 1 TO J.
 MOVE 'NOT M-H' TO ROW-NAME-1.
 MOVE 'M-H' TO ROW-NAME-2.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 PERFORM COMPUTE-CHI.
 MOVE 1 TO Q.
 ADD 1 TO R.

COMPUTE-HYP-10.

MOVE '0100' TO HD-AREA (1, 1).
 ADD PHY-HAN (A, J) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (A, J) TO ACTUAL-CELL (1, Q).
 SUBTRACT PHY-HAN (A, J) FROM ACTUAL-CELL (1, Q).
 IF A < 14 ADD 1 TO A GO TO COMPUTE-HYP-10.
 MOVE 1 TO A.
 ADD 1 TO J.
 IF ACTUAL-CELL (1, Q) > 0 ADD 1 TO Q GO TO CONT-10.
 IF ACTUAL-CELL (2, Q) > 0 ADD 1 TO Q.

CONT-10.

COMPUTE B = Q / 5.0001 + 1.
 COMPUTE TMP = Q - (B - 1) * 5.
 MOVE PRO-CODE (J) TO HD-AREA (B, TMP).
 IF J < 201 GO TO COMPUTE-HYP-10.
 MOVE 1 TO J.
 MOVE 'NOT P-H' TO ROW-NAME-1.
 MOVE 'P-H' TO ROW-NAME-2.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 PERFORM COMPUTE-CHI.

MOVE 1 TO Q.
 ADD 1 TO R.
 COMPUTE-HYP-11.
 ADD ACA-DIS (J, A) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (J, A) TO ACTUAL-CELL (1, Q).
 SUBTRACT ACA-DIS (J, A) FROM ACTUAL-CELL (1, Q).
 $COMPUTE\ B = Q / 5.0001 + 1.$
 $COMPUTE\ TMP = Q - (B - 1) * 5.$
 IF ACTUAL-CELL (1, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (B, TMP) ADD 1 TO Q GO TO CONT-11.
 IF ACTUAL-CELL (2, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (B, TMP) ADD 1 TO Q.
 CONT-11.
 IF J < 14 ADD 1 TO J GO TO COMPUTE-HYP-11.
 MOVE 1 TO J, Q.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 MOVE 'NOT A-D' TO ROW-NAME-1.
 MOVE 'A-D' TO ROW-NAME-2.
 MOVE PRO-CODE (A) TO CONTRL.
 $COMPUTE\ K = ACTUAL-CELL\ (1,\ 1) + ACTUAL-CELL\ (2,\ 1).$
 IF K = 0 GO TO JUMP-PERFORM-11.
 PERFORM COMPUTE-CHI.
 JUMP-PERFORM-11.
 ADD 1 TO A.
 MOVE ZERO TO K.
 IF A < 201 GO TO COMPUTE-HYP-11.
 ADD 1 TO R.
 MOVE 1 TO A, J, Q.
 COMPUTE-HYP-12.
 ADD NON-WHITE (J, A) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (J, A) TO ACTUAL-CELL (1, Q).
 SUBTRACT NON-WHITE (J, A) FROM ACTUAL-CELL (1, Q).
 $COMPUTE\ B = Q / 5.0001 + 1.$
 $COMPUTE\ TMP = Q - (B - 1) * 5.$
 IF ACTUAL-CELL (1, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (B, TMP) ADD 1 TO Q GO TO CONT-12.
 IF ACTUAL-CELL (2, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (B, TMP) ADD 1 TO Q.
 CONT-12.
 IF J < 14 ADD 1 TO J GO TO COMPUTE-HYP-12.
 MOVE 1 TO J, Q.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 MOVE 'NOT N-W' TO ROW-NAME-1.
 MOVE 'N-W' TO ROW-NAME-2.
 MOVE PRO-CODE (A) TO CONTRL.
 $COMPUTE\ K = ACTUAL-CELL\ (1,\ 1) + ACTUAL-CELL\ (2,\ 1).$
 IF K = 0 GO TO JUMP-PERFORM-12.
 PERFORM COMPUTE-CHI.
 JUMP-PERFORM-12.
 ADD 1 TO A.
 MOVE ZERO TO K.
 IF A < 201 GO TO COMPUTE-HYP-12.
 ADD 1 TO R.
 MOVE 1 TO A, J, Q.

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COMPUTE-HYP-13.

ADD ECO-DIS (J, A) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (J, A) TO ACTUAL-CELL (1, Q).
 SUBTRACT ECO-DIS (J, A) FROM ACTUAL-CELL (1, Q).
 COMPUTE $R = Q / 5.0001 + 1$.
 COMPUTE $TMP = Q - (R - 1) * 5$.
 IF ACTUAL-CELL (1, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (R, TMP) ADD 1 TO Q GO TO CONT-13.
 IF ACTUAL-CELL (2, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (R, TMP) ADD 1 TO Q.

CONT-13.

IF J < 14 ADD 1 TO J GO TO COMPUTE-HYP-13.
 MOVE 1 TO J, Q.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 MOVE 'NOT E-D' TO ROW-NAME-1.
 MOVE 'E-D' TO ROW-NAME-2.
 MOVE PRO-CODE (A) TO CONTRL.
 COMPUTE $K = \text{ACTUAL-CELL (1, 1)} + \text{ACTUAL-CELL (2, 1)}$.
 IF K = 0 GO TO JUMP-PERFORM-13.
 PERFORM COMPUTE-CHI.

JUMP-PERFORM-13.

ADD 1 TO A.
 MOVE ZERO TO K.
 IF A < 201 GO TO COMPUTE-HYP-13.
 ADD 1 TO R.
 MOVE 1 TO A, J, Q.

COMPUTE-HYP-14.

ADD MEN-HAN (J, A) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (J, A) TO ACTUAL-CELL (1, Q).
 SUBTRACT MEN-HAN (J, A) FROM ACTUAL-CELL (1, Q).
 COMPUTE $R = Q / 5.0001 + 1$.
 COMPUTE $TMP = Q - (R - 1) * 5$.
 IF ACTUAL-CELL (1, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (R, TMP) ADD 1 TO Q GO TO CONT-14.
 IF ACTUAL-CELL (2, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (R, TMP) ADD 1 TO Q.

CONT-14.

IF J < 14 ADD 1 TO J GO TO COMPUTE-HYP-14.
 MOVE 1 TO J, Q.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 MOVE 'NOT M-H' TO ROW-NAME-1.
 MOVE 'M-H' TO ROW-NAME-2.
 MOVE PRO-CODE (A) TO CONTRL.
 COMPUTE $K = \text{ACTUAL-CELL (1, 1)} + \text{ACTUAL-CELL (2, 1)}$.
 IF K = 0 GO TO JUMP-PERFORM-14.
 PERFORM COMPUTE-CHI.

JUMP-PERFORM-14.

ADD 1 TO A.
 MOVE ZERO TO K.
 IF A < 201 GO TO COMPUTE-HYP-14.
 ADD 1 TO R.
 MOVE 1 TO A, J, Q.

COMPUTE-HYP-15.

ADD PHY-HAN (J, A) TO ACTUAL-CELL (2, Q).
 ADD TOTAL-ENR (J, A) TO ACTUAL-CELL (1, Q).
 SUBTRACT PHY-HAN (J, A) FROM ACTUAL-CELL (1, Q).
 COMPUTE B = Q / 5.0001 + 1.
 COMPUTE TMP = Q - (B - 1) * 5.
 IF ACTUAL-CELL (1, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (B, TMP) ADD 1 TO Q GO TO CONT-15.
 IF ACTUAL-CELL (2, Q) > 0 MOVE SCH-CODE (J) TO
 HD-AREA (B, TMP) ADD 1 TO Q.

CONT-15.

IF J < 14 ADD 1 TO J GO TO COMPUTE-HYP-15.
 MOVE 1 TO J, Q.
 MOVE HEAD (R) TO VARIABLE-HEADER.
 MOVE 'NOT P-H' TO ROW-NAME-1.
 MOVE 'P-H' TO ROW-NAME-2.
 MOVE PRO-CODE (A) TO CONTRL.
 COMPUTE K = ACTUAL-CELL (1, 1) + ACTUAL-CELL (2, 1).
 IF K = 0 GO TO JUMP-PERFORM-15.
 PERFORM COMPUTE-CHI.

JUMP-PERFORM-15.

ADD 1 TO A.
 MOVE ZERO TO K.
 IF A < 201 GO TO COMPUTE-HYP-15.
 ADD 1 TO R.
 MOVE 1 TO A, J, Q.

WRAP-UP.

CLOSE INPUT-FILE, SCHOOL-FILE, PROGRAM-FILE, HEAD-FILE,
 PRINT-FILE.
 STOP RUN.

INITIALIZING SECTION.

NOTE-PARAGRAPH.

NOTE:

```
*****
*
* THIS SECTION MOVES ZEROES, BLANKS, ETC. INTO
* APPROPRIATE DATA DIVISION VARIABLES.
*
*****
```

PARAGRAPH-1.

MOVE ZEROES TO ACA-DIS (I, J), NON-WHITE (I, J),
 ECO-DIS (I, J), PHY-HAN (I, J), MEN-HAN (I, J),
 TOTAL-DIS-HAN (I, J), TOTAL-ENR (I, J).
 ADD 1 TO J.
 IF J < 201 GO TO PARAGRAPH-1.
 MOVE 1 TO J.
 ADD 1 TO I.
 IF I < 15 GO TO PARAGRAPH-1.
 MOVE 1 TO I.

PARAGRAPH-2.

MOVE ZEROES TO ACTUAL-CELL (I, J), EXPECTED-CELL (I, J),
 COLUMN-TOTAL (J).
 ADD 1 TO I.

IF I < 3 GO TO PARAGRAPH-2. BEST COPY AVAILABLE

MOVE 1 TO I.

ADD 1 TO J.

IF J < 201 GO TO PARAGRAPH-2.

MOVE 1 TO J.

MOVE ZEROES TO ROW-TOTAL (1), ROW-TOTAL (2).

PARAGRAPH-3.

MOVE SPACES TO CX (J), CY (J), CZ (J), HO-AREA (J, I)

HEAD-1-LINE (J), HEAD-2-LINE (J), ACT-OUT-1 (J, I),

ACT-OUT-2 (J, I).

ADD 1 TO J.

IF J < 41 GO TO PARAGRAPH-3.

MOVE 1 TO J.

ADD 1 TO I.

IF I < 6 GO TO PARAGRAPH-3.

MOVE 1 TO I.

READ-DATA SECTION.

NOTE-PARAGRAPH.

NOTE:

```
*****
*
* THIS SECTION READS INPUT DATA FOR CALCULATIONS.
* THE FIRST PARAGRAPH READS THE SCHOOL FILE WHICH
* CONTAINS ALL POSSIBLE SCHOOL CODES. THE SECOND
* PARAGRAPH READS THE PROGRAM FILE WHICH CONTAINS
* ALL POSSIBLE PROGRAM CODES. THE THIRD, FOURTH,
* FIFTH, SIXTH AND SEVENTH PARAGRAPHS READ THE
* INPUT FILE WHICH CONTAINS STUDENT DATA AND
* PREPARES A MATRIX OF DATA BY SCHOOL, PROGRAM
* AND TYPES OF STUDENTS. THE EIGHTH FILE READS
* PAGE HEADERS FOR OUTPUT REPORTS.
*
*****
```

PARAGRAPH-ONE.

READ SCHOOL-FILE INTO SCHOOL-CODE (I) AT END MOVE 1 TO I
GO TO PARAGRAPH-TWO.

ADD 1 TO I.

GO TO PARAGRAPH-ONE.

PARAGRAPH-TWO.

READ PROGRAM-FILE INTO PROGRAM-CODE (J) AT END MOVE 1 TO J
GO TO PARAGRAPH-THREE.

ADD 1 TO J.

GO TO PARAGRAPH-TWO.

PARAGRAPH-THREE.

READ INPUT-FILE AT END MOVE ' ERROR IN INPUT TAPE' TO
P-LINE, WRITE P-LINE AFTER POSITIONING 0 LINES, STOP RUN.

PARAGRAPH-FOUR.

READ INPUT-FILE INTO INPUT-AREA AT END GO TO
PARAGRAPH-EIGHT.

PARAGRAPH-FIVE.

IF SCH-CODE-IN = SCH-CODE (I) GO TO PARAGRAPH-SIX.

ADD 1 TO I.

IF I > 14 MOVE 1 TO I GO TO PARAGRAPH-FOUR.

GO TO PARAGRAPH-FIVE.

PARAGRAPH-SIX.

IF PRO-CODE-IN = PRO-CODE (J) GO TO PARAGRAPH-SEVEN.

ADD 1 TO J.

IF J > 200 MOVE 1 TO I, J, GO TO PARAGRAPH-FOUR.

GO TO PARAGRAPH-SIX.

PARAGRAPH-SEVEN.

ADD 1 TO TOTAL-ENR (I, J).

IF RACE NOT = '8' ADD 1 TO NON-WHITE (I, J).

IF S = '1' ADD 1 TO TOTAL-DIS-HAN (I, J).

IF T = '1' ADD 1 TO ECO-DIS (I, J).

IF T = '2' ADD 1 TO ACA-DIS (I, J).

IF T = '3' ADD 1 TO ACA-DIS (I, J), ECO-DIS (I, J).

IF U > '0' ADD 1 TO PHY-HAN (I, J).

IF V > '0' ADD 1 TO MEN-HAN (I, J).

IF RACE = '8' MOVE 1 TO I, J, GO TO PARAGRAPH-FOUR.

IF S NOT = '1' ADD 1 TO TOTAL-DIS-HAN (I, J).

MOVE 1 TO I, J.

GO TO PARAGRAPH-FOUR.

PARAGRAPH-EIGHT.

READ HEAD-FILE INTO HEAD (J) AT END GO TO PARAGRAPH-NINE.

ADD 1 TO J.

GO TO PARAGRAPH-EIGHT.

PARAGRAPH-NINE.

MOVE 1 TO J.

RAW-DATA-PRINT SECTION.

NOTE-PARAGRAPH.

NOTE:

```

*****
*
* THIS SECTION PRINTS RAW DATA BY SCHOOL BY PROGRAM *
* FROM THE DATA MATRIX. PARAGRAPH ONE WRITES *
* HEADINGS. PARAGRAPH TWO MOVES DATA TO A STANDARD *
* OUTPUT AREA AND PRINTS THE DATA. PARAGRAPH THREE *
* AND FOUR SET UP A LOOP AND PARAGRAPH FIVE IS AN *
* EXIT PARAGRAPH. *
*
*****

```

PAR-1.

WRITE P-LINE FROM MAJOR-HEADER AFTER POSITIONING 0 LINES.

WRITE P-LINE FROM HEAD-2 AFTER POSITIONING 1 LINES.

WRITE P-LINE FROM RAW-DATA-COLUMN-HEADS AFTER POSITIONING 3 LINES.

ADD 11 TO LINE-COUNT.

PAR-2.

IF TOTAL-ENR (I, J) = ZEROES GO TO PAR-3.

MOVE PRO-CODE (J) TO PROGRAM-OUT.

MOVE SCH-CODE (I) TO SCHOOL-OUT.

MOVE ACA-DIS (I, J) TO ACA.

MOVE ECO-DIS (I, J) TO ECO.

MOVE NON-WHITE (I, J) TO CUL.

MOVE MEN-HAN (I, J) TO MEN.

MOVE PHY-HAN (I, J) TO PHY.

MOVE TOTAL-ENR (I, J) TO ENR.
 MOVE TOTAL-DIS-HAN (I, J) TO TOT.
 COMPUTE PCT-DIS-HAN = TOTAL-DIS-HAN (I, J) /
 TOTAL-ENR (I, J).
 MOVE PCT-DIS-HAN TO PCT.
 WRITE P-LINE FROM RAW-DATA-OUTPUT-LINE AFTER POSITIONING
 2 LINES.
 ADD 2 TO LINE-COUNT.
 IF LINE-COUNT > 98 MOVE 0 TO LINE-COUNT, PERFORM PAR-1.
 PAR-3.
 ADD 1 TO J.
 IF J > 200 MOVE 1 TO J GO TO PAR-4.
 GO TO PAR-2.
 PAR-4.
 ADD 1 TO I.
 IF I > 14 MOVE 1 TO I, J, GO TO PAR-5.
 GO TO PAR-2.
 PAR-5.
 MOVE 0 TO LINE-COUNT.
 COMPUTE-CHI SECTION.
 NOTE-PARAGRAPH.
 NOTE:

 *
 * THIS SECTION COMPUTES TABULAR AND CALCULATED CHI *
 * SQUARE VALUES FOR ALL HYPOTHESES IN THE JONES *
 * DISSERTATION. BEFORE ANY CHI VALUE CAN BE COM- *
 * PUTED, ACTUAL CELL VALUES AND COLUMN-ROW IDEN- *
 * TIFICATION MUST BE PROVIDED. THE FIRST PARAGRAPH *
 * COMPUTES THE DEGREES OF FREEDOM PLUS 1 WHICH IS *
 * THE NUMBER OF COLUMNS (THE NUMBER OF ROWS IS *
 * ALWAYS 2). THE SECOND PARAGRAPH COMPUTES COLUMN *
 * AND ROW TOTALS AS WELL AS N. (IF THERE IS ONLY *
 * ONE COLUMN OR IF EITHER ROW TOTALS ZERO, THE *
 * CHI VALUE IS UNCOMPUTABLE AND A BRANCH OCCURS.) *
 * THE THIRD PARAGRAPH COMPUTES EXPECTED CELL *
 * VALUES. THE FOURTH PARAGRAPH COMPUTES CELL *
 * CONTRIBUTIONS AND THE CALCULATED CHI. THE FIFTH *
 * PARAGRAPH COMPUTES THE TABULAR CHI. THE SIXTH *
 * PARAGRAPH MOVES CELL DATA TO PRINT LINES. THE *
 * SEVENTH PARAGRAPH WRITES HEADING DATA FOR CHI *
 * CALCULATIONS. THE EIGHTH-PARAGRAPH WRITES CELL *
 * DATA. THE NINTH-PARAGRAPH HANDLES UNCOMPUTABLE *
 * CHIS. THE TENTH, ELEVENTH AND TWELFTH PARAGRAPHS *
 * RE-INITIALIZE VARIABLES.
 *

FIRST-PARAGRAPH.
 IF ACTUAL-CELL (1, J) > 0 ADD 1 TO NO-COLUMNS, J; GO TO
 FIRST-PARAGRAPH.
 IF ACTUAL-CELL (2, J) > 0 ADD 1 TO NO-COLUMNS, J; GO TO
 FIRST-PARAGRAPH.
 MOVE 1 TO J.

IF NO-COLUMNS NOT > 1 GO TO NINTH-PARAGRAPH.

SECOND-PARAGRAPH.
 COMPUTE ROW-TOTAL (I) = ROW-TOTAL (I) + ACTUAL-CELL (I, J).
 COMPUTE COLUMN-TOTAL (J) = COLUMN-TOTAL (J) + ACTUAL-CELL (I, J).
 COMPUTE N = N + ACTUAL-CELL (I, J).
 ADD 1 TO J.
 IF J NOT > NO-COLUMNS GO TO SECOND-PARAGRAPH OTHERWISE
 MOVE 1 TO J.
 IF I < 2 ADD 1 TO I GO TO SECOND-PARAGRAPH OTHERWISE
 MOVE 1 TO I.
 IF ROW-TOTAL (I) NOT > 0 GO TO NINTH-PARAGRAPH.
 IF ROW-TOTAL (2) NOT > 0 GO TO NINTH-PARAGRAPH.

THIRD-PARAGRAPH.
 COMPUTE EXPECTED-CELL (I, J) = ROW-TOTAL (I) * COLUMN-TOTAL (J) / N.
 ADD 1 TO J.
 IF J NOT > NO-COLUMNS GO TO THIRD-PAPAGRAPH OTHERWISE
 MOVE 1 TO J.
 IF I < 2 ADD 1 TO I; GO TO THIRD-PARAGRAPH OTHERWISE
 MOVE 1 TO I.

FOURTH-PARAGRAPH.
 COMPUTE SUM-HOLD = (ACTUAL-CELL (I, J) - EXPECTED-CELL (I, J)) ** 2.
 COMPUTE CALCULATED-CHI = CALCULATED-CHI + SUM-HOLD / EXPECTED-CELL (I, J).
 ADD 1 TO J.
 IF J NOT > NO-COLUMNS GO TO FOURTH-PARAGRAPH OTHERWISE
 MOVE 1 TO J.
 IF I < 2 ADD 1 TO I; GO TO FOURTH-PARAGRAPH OTHERWISE
 MOVE 1 TO I.

FIFTH-PARAGRAPH.
 COMPUTE P = NO-COLUMNS - 1.
 COMPUTE TABULAR-CHI = 0.5 * (1.639 + ((2 * (NO-COLUMNS - 1)) - 1) ** 0.5) ** 2.
 IF NO-COLUMNS < 31 MOVE CHI-VALUES (P) TO TABULAR-CHI.

SIXTH-PARAGRAPH.
 COMPUTE TME = J - (L - 1) * 5.
 MOVE ACTUAL-CELL (I, J) TO ACT-OUT-1 (L, TME).
 COMPUTE TME = J - (L - 1) * 5.
 MOVE ACTUAL-CELL (2, J) TO ACT-OUT-2 (L, TME).
 COMPUTE L = J / 5 + 1.
 IF J < NO-COLUMNS ADD 1 TO J GO TO SIXTH-PARAGRAPH.
 MOVE 1 TO L.

SEVENTH-PARAGRAPH.
 WRITE P-LINE FROM MAJOR-HEADER AFTER POSITIONING 0 LINES.
 WRITE P-LINE FROM VARIABLE-HEADER AFTER POSITIONING 1 LINES
 IF CONTRL NOT = SPACES WRITE P-LINE FROM CONTRL-LINE AFTER POSITIONING 3 LINES.
 IF TABULAR-CHI > CALCULATED-CHI MOVE 'REJECTED' TO STATUS1
 OTHERWISE MOVE 'RETAINED' TO STATUS1.
 MOVE TABULAR-CHI TO TAB-CHI.
 MOVE CALCULATED-CHI TO COM-CHI.
 WRITE P-LINE FROM DISPOSITION-LINE AFTER POSITIONING 3 LINES.

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EIGHTH-PARAGRAPH.

MOVE ROW-NAME-1 TO HEAD-1-LINE (L).
 MOVE ROW-NAME-2 TO HEAD-2-LINE (L).
 WRITE P-LINE FROM CHI-HEADER (L) AFTER POSITIONING 3 LINES.
 WRITE P-LINE FROM CHI-LINE-1 (L) AFTER POSITIONING 2 LINES.
 WRITE P-LINE FROM CHI-LINE-2 (L) AFTER POSITIONING 2 LINES.
 COMPUTE $J = J - 5$.
 IF $J > 0$ ADD 1 TO L GO TO EIGHTH-PARAGRAPH.
 SUBTRACT 1 FROM NO-COLUMNS GIVING DF.
 WRITE P-LINE FROM DF-LINE AFTER POSITIONING 3 LINES.
 MOVE 1 TO L, J.
 GO TO TENTH-PARAGRAPH.

NINTH-PARAGRAPH.

WRITE P-LINE FROM MAJOR-HEADER AFTER POSITIONING 0 LINES.
 WRITE P-LINE FROM VARIABLE-HEADER AFTER POSITIONING 1 LINES.
 IF CONTRL NOT = SPACES WRITE P-LINE FROM CONTRL-LINE
 AFTER POSITIONING 3 LINES.
 MOVE 'UNCOMPUT' TO STATUS1.
 MOVE 'N/A' TO TAB-CHI-CHR, COM-CHI-CHR.
 WRITE P-LINE FROM DISPOSITION-LINE AFTER POSITIONING 3 LINES.

TENTH-PARAGRAPH.

MOVE 1 TO I, J, L.
 MOVE SPACES TO ROW-NAME-1, ROW-NAME-2, STATUS1.
 MOVE ZEROS TO CALCULATED-CHI, TABULAR-CHI, N, ROW-TOTAL (1)
 ROW-TOTAL (2), TAB-CHI, COM-CHI, NO-COLUMNS, DF.

ELEVENTH-PARAGRAPH.

MOVE ZEROS TO ACTUAL-CELL (1, J), ACTUAL-CELL (2, J),
 EXPECTED-CELL (1, J), EXPECTED-CELL (2, J),
 COLUMN-TOTAL (J).
 IF $J < 200$ ADD 1 TO J GO TO ELEVENTH-PARAGRAPH OTHERWISE
 MOVE 1 TO J.

TWELFTH-PARAGRAPH.

MOVE SPACES TO ACT-OUT-1 (I, J), ACT-OUT-2 (I, J),
 HD-AREA (I, J).
 IF $J < 6$ ADD 1 TO J GO TO TWELFTH-PARAGRAPH OTHERWISE
 MOVE 1 TO J.
 IF $I < 40$ ADD 1 TO I GO TO TWELFTH-PARAGRAPH OTHERWISE
 MOVE 1 TO I, J.

APPENDIX M
RAW DATA SUMMARY

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School Decoding for Raw-Data Program

School Code	School Name
383907	Central Kansas AVTS
185912	Cowley County AVTS
527905	Flint Hills AVTS
968914	Kansas City AVTS
824909	Kaw AVTS
815913	Liberal AVTS
752910	Manhattan AVTS
581902	North Central Kansas AVTS
050901	Northeast Kansas AVTS
842906	Northwest Kansas AVTS
788908	Salina AVTS
590903	Southeast Kansas AVTS
284904	Southwest Kansas AVTS
806911	Wichita AVTS

Program Decoding for Raw-Data Programs

Program Code	Program Name
0100	Agricultural Related Occupations
0101	Agricultural Production
0103	Agricultural Mechanics
0105	Ornamental Horticulture
0181	Farm Ranch Management
0182	Agri-Business Technology
0183	Agricultural Mechanics (Post Secondary)
0185	Horticulture (Post Secondary)
0400	Distributive Education Prep
0480	Distributive Education 1 yr. (Post Secondary)
0490	Distributive Education Adult
0741	Nurses Aide
0742	Occupational Therapy Assistant
0744	Medical Laboratory Technician
0746	Practical Nurse
0753	Medical Record Technician
0791	Nurse Assistant
0911	Comprehensive Home Economics
0912	Child Development and Guidance
0913	Clothing and Textiles

(Table Continued)

Program Code	Program Name
0914	Consumer Education
0915	Boys Home Economics
0916	Family Living
0917	Foods and Nutrition
0919	Housing and Home Furnishing
0921	Child Care Services
0922	Introduction to Sewing Machines
0923	Food Production and Services
0924	Home Furnishing, Equipment and Services
0998	Home Health Aide
0999	Introduction to Occupations
1400	Business Education
1480	Business Education First Year Cooperative Program
1490	Business Education Adult
1601	Engineering Related Technology
1604	Chemical Technology
1605	Electrical Technology
1606	Civil Technology
1607	Electronic Technology
1710	Industrial Technology
1611	Instrumentation Technology
1612	Mechanical Technical

(Table Continued)

Program Code	Program Name
1616	Scientific Technology
1622	Police Science
1624	Engineering Technology
1701	Air Conditioning and Refrigeration
1702	Appliance Repair
1703	Auto Body Repair
1704	Auto Mechanic
1705	Automotive Specialization
1707	Aircraft Mechanics
1709	Blueprint Reading
1711	Commercial Art Occupations
1712	Commercial Photography Occupations
1713	Carpentry
1714	Electricity
1715	Heavy Equipment-Construction
1716	Masonry
1717	Painting and Decorating
1719	Plumbers and Pipefitting
1720	Other Construction and Maintenance
1721	Custodial Services
1722	Diesel Mechanics
1723	Fluid Power
1724	Drafting Occupations

(Table Continued)

Program Code	Program Name
1725	Industrial Electrician
1728	Other Electrical Occupations
1729	Electronics Communication
1730	Electronics Industry
1731	Radio and Television
1732	Other Electronics Occupations
1738	Graphic Arts Occupations-Printing
1741	Machine Shop
1742	Machine Tool Operations
1744	Sheet Metal
1745	Welding
1746	Other Metalworking Occupations
1747	Metallurgy Occupations
1748	Cosmetology
1750	Plastics Occupations
1752	Law Enforcement Training
1753	Other Public Services
1759	Refrigeration
1760	Small Engine Repair-Int. Comb.
1768	Upholstery
1769	Millwork and Cabinetmaking
1771	Other Trades and Industry Occupations

(Table Continued)

Program Code	Program Name
1772	Industrial Mechanics
1773	Marine Mechanics

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
383907	0101	14	1	11	6	4	23	74	.31
383907	0103	43	7	20	20	4	69	168	.41
383907	0185	1		1			2	6	.33
383907	0400	10	22	22	4	27	50	179	.27
383907	0480	1	2	10		2	12	45	.26
383907	0490		1				1	13	.07
383907	0741		2				2	23	.08
383907	0746		1	11	1		11	24	.45
383907	0753	2	1	2	4	1	6	51	.11
383907	0913							10	.00
383907	0919							21	.00
383907	0923		1				1	19	.05
383907	1400	2	6	2		1	10	62	.16
383907	1480		2	3	1	2	6	66	.09
383907	1490		1			2	3	40	.07
383907	1605							3	.00
383907	1607	3		2	1	1	7	44	.15
383907	1610					1	1	7	.14
383907	1612		1	1	1	2	3	20	.15
383907	1704	5	4	5	4	8	21	123	.17
383907	1713	13		9	9	3	24	43	.55
383907	1728	1	1	6	3		7	20	.35
383907	1738		1	2		1	5	16	.31
383907	1741	5	6	9	3	1	12	65	.18

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
393907	1752		6	1			7	61	.11
185912	0181							1	.00
185912	0182			1	8	3	12	37	.32
185912	0480			3			3	26	.11
185912	1480	2	4	11	5	3	13	56	.23
185912	1490							1	.00
185912	1607							13	.00
185912	1622		2				2	37	.05
185912	1704		1				1	28	.03
185912	1713		2	2			2	21	.09
185912	1724	2	1	4	3	2	6	28	.21
185912	1742							23	.00
185912	1744							1	.00
185912	1745		1	11	10	1	16	35	.45
527905	0101	29	2	9	7	6	31	41	.75
527905	0181	5	1	2	2	4	9	13	.69
527905	0400	10	6	4	1	1	14	18	.77
527905	0480	1		1			2	8	.25
527905	0741	1	1	6			6	13	.46
527905	0746	17	2	6	1	6	19	21	.90
527905	0753		4	3			6	21	.28
527905	1400	6		2		2	10	18	.55
527905	1480	5	2	3		1	9	17	.52
527905	1490	3	7	14			14	27	.51

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
527905	1704	33	2	10	6	5	38	67	.56
527905	1709							10	.00
527905	1713	15	1	7	4	4	22	32	.68
527905	1729	7		2	2	1	10	24	.41
527905	1738	9		4	12	2	16	30	.53
527905	1742	7	1	2	3	1	9	17	.52
527905	1745	22	1	10	21	5	27	42	.64
968914	0400		5	3			5	32	.15
968914	0490		12				12	33	.36
968914	0741		5				5	13	.38
968914	0746		20	5			20	53	.37
968914	0791		15	4		1	15	44	.34
968914	0923		15				15	23	.65
968914	1400		14	5			14	37	.37
968914	1480		22	6			23	88	.26
968914	1490		23				23	124	.18
968914	1607		5		1	1	6	66	.09
968914	1702		1				1	21	.04
968914	1703		7				7	48	.14
968914	1704		36	7			36	125	.28
968914	1713		11	6			11	11	1.00
968914	1724		5				5	29	.17
968914	1731		6	1			6	26	.23
968914	1738		11				31	97	.31

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
968914	1741		6				6	16	.37
968914	1745		22				22	65	.33
968914	1748		9				9	36	.25
824909	0100		1	1			1	1	1.00
824909	0101	1	7	5	7		14	38	.36
824909	0400	3	5	2			7	28	.25
824909	0490							28	.00
824909	0741	3		5	3	1	8	19	.42
824909	0746	1	11	25	3	1	30	65	.46
824909	0753			5			5	19	.26
824909	0791		3				3	29	.10
824909	0923		14				14	42	.33
824909	1400	1	9	4	1	1	14	54	.25
824909	1480	3	14	3			15	67	.22
824909	1490		2				2	16	.12
824909	1601	3	1	1	2	2	7	32	.21
824909	1604							1	.00
824909	1605	1					1	1	1.00
824909	1606	3	5	1			7	38	.18
824909	1701		2				2	19	.10
824909	1703		8	10		1	11	86	.12
824909	1704	8	8	2	4	1	20	114	.17
824909	1709		1				1	6	.16
824909	1712		3				3	35	.08

BEST COPY AVAILABLE

SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
824909	1714		3				3	43	.06
824909	1715		2				2	16	.12
824909	1717		1				1	5	.20
824909	1719		6				6	33	.18
824909	1720		1				1	7	.14
824909	1728		3				3	33	.09
824909	1731	2	3				5	72	.06
824909	1738		2		3		4	25	.16
824909	1741		1				2	52	.03
824909	1744		2				2	14	.14
824909	1745	12	3	1	1	4	16	85	.18
824909	1759							9	.00
824909	1760		2	1		1	3	50	.06
815913	0100		1				1	12	.08
815913	0101	11	1	6	1	3	16	42	.38
815913	0105	1	1				1	8	.12
815913	0182	2		4			6	11	.54
815913	0400	.1	5		1	3	8	53	.15
815913	0740	4	2	5		2	8	11	.72
815913	0741		1	1			1	10	.10
815913	0911	7	31	37	17	9	79	375	.21
815913	0912			1			1	11	.09
815913	0913	3	24	16	2	1	31	99	.31
815913	0914			4			4	13	.30

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
815913	0915							6	.00
815913	0916		3				3	24	.12
815913	0917	2	9	4			10	42	.23
815913	1400		6	6			6	71	.08
815913	1480	5				1	6	12	.50
815913	1490	1		1		1	2	25	.08
815913	1607	2		1		1	3	32	.09
815913	1611	6					6	11	.54
815913	1701		2	2	3		4	23	.17
815913	1704	10	1	2		2	13	80	.16
815913	1713	18	1	4	1	2	19	29	.65
815913	1716	5		2			6	6	1.00
815913	1722	16		7		1	20	31	.64
815913	1724	4			1	1	4	21	.19
815913	1745	17	1	2		1	18	39	.46
815913	1769	2					2	14	.14
752910	0400	5	3	1			9	24	.37
752910	0480	3	1				4	7	.57
752910	0746	7	2	3			11	35	.31
752910	0913		8				8	40	.20
752910	0919		5				5	39	.12
752910	1480	18	3	3		1	24	78	.30
752910	1490		6				6	55	.10
752910	1701	10	1	1			10	41	.24

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
752910	1704	12	4	2			13	27	.48
752910	1705		2				2	21	.09
752910	1719		1				1	14	.07
752910	1723							1	.00
752910	1724	7	1	1		1	9	23	.39
752910	1732		3				3	16	.18
752910	1738	8	1	1	1	1	9	24	.37
752910	1745	3	1	1		1	5	18	.27
752910	1772	2	1			1	3	7	.42
752910	1773	2	1			1	2	6	.33
581902	0103	1		3		1	5	7	.71
581902	0181	4				2	6	49	.12
581902	0183	3		18	5	7	23	34	.67
581902	0480	3		4	1		5	8	.62
581902	0746	3		17	5	1	21	33	.63
581902	0913		1				1	25	.04
581902	0924							14	.00
581902	1400			2			2	3	.66
581902	1480	11		15	1	2	21	58	.36
581902	1605	6	1	2	5	2	14	31	.45
581902	1607	5		2	3	1	9	33	.27
581902	1704	11		8		1	15	38	.39
581902	1713	1		4		1	4	24	.16
581902	1715	4	1	13	2	3	16	38	.42

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
581902	1716			3	1	2	5	16	.31
581902	1722	7		8	1	1	12	28	.42
581902	1745	4	1	2	2	2	7	34	.20
050901	0746		2	8			8	17	.47
050901	0913		2				2	12	.16
050901	0919							10	.00
050901	0923	6	3	6	4		7	19	.36
050901	1400	4	4	6		1	4	45	.08
050901	1480	6	2	7		4	2	23	.08
050901	1703	5	3	7	1	4	7	38	.18
050901	1704		6	10		4	19	105	.18
050901	1731	1	1	2	1	2	3	16	.18
050901	1738			5		6		22	.00
050901	1745	2	4	3	1	5	5	54	.09
842906	1480	5	1	13	2	3	18	35	.51
842906	1703	13	1	5	8	10	18	40	.45
842906	1704	22	1	17	18	9	34	94	.36
842906	1713	6		2	6	6	11	32	.34
842906	1714	5	1	4	9	13	20	33	.60
842906	1722	24		1	15	4	32	59	.54
842906	1724			5	1	3	9	19	.47
842906	1729	1		3	1	13	15	32	.46
842906	1730	1			1		1	5	.20
842906	1748			2	5	3	10	31	.32

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
788908	0400	4	23	10	1	5	41	254	.16
788908	0741		4				4	17	.23
788908	1400		1				1	12	.08
788908	1701		1	2	4	3	9	30	.30
788908	1703	13	2	6	2	5	28	61	.45
788908	1704	2	4	1	2	4	10	77	.12
788908	1711							36	.00
788908	1719							4	.00
788908	1722	3	1	8	2	3	10	51	.19
788908	1724	1		3		3		26	.00
788908	1729	3	2	9		4	11	33	.33
788908	1738	2	4	5	5	1	8	15	.53
788908	1741			2		1	1	15	.06
788908	1745	5	3	3	9	4	11	52	.21
788908	1746							5	.00
788908	1753		2			1	2	8	.25
590903	0100							1	.00
590903	0101	42	19	25	1		61	99	.61
590903	0103	2		1			3	3	1.00
590903	0181		1	10		11	18	41	.43
590903	0400	28	8	14	10	10	30	70	.42
590903	0480		7	1	1	1	8	72	.11
590903	0741		4				4	8	.50
590903	0744		2				2	15	.13

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
590903	0746	1		9		1	10	27	.37
590903	0911	6	2	21	6		26	55	.47
590903	0922	8	1	8	4	1	9	11	.81
590903	0923			9		1	9	14	.64
590903	1400	3	1	6			7	18	.38
590903	1480	7	22	14	8	4	28	153	.18
590903	1490		2				2	14	.14
590903	1704	76	3	35	13	9	94	149	.63
590903	1724		1	5	1	2	6	21	.28
590903	1731		2	11	17	1	21	35	.60
590903	1738	12	1	12		1	20	32	.62
590903	1741	16	1	23	14	9	15	85	.17
590903	1745		1				1	11	.09
590903	1748			1				29	.00
284904	0100		2	1			3	9	.33
284904	0101	19	8	21	11	1	53	161	.32
284904	0105							15	.00
284904	0181	5	1	3	19		20	48	.41
284904	0182							20	.00
284904	0183			2	5		5	9	.55
284904	0400	19	10	14	20	4	41	127	.32
284904	0480		3	17	1	2	19	50	.38
284904	0746	6	2	6			14	42	.33
284904	0911		5	3	4	1	10	70	.14

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
284904	0916		11	5	1	1	18	54	.33
284904	0922		3	1		1	4	13	.30
284904	0999	2	5	3			7	27	.25
284904	1400	1	1	6	1	3	11	49	.22
284904	1480	22	7	18	1		25	30	.83
284904	1704		3	4			5	37	.13
284904	1725							11	.00
284904	1731	1	3	6	2		6	21	.28
284904	1741	1					1	14	.07
284904	1745		4	4	1	1	7	26	.26
284904	1747	4			3		6	16	.37
284904	1748			3			3	30	.10
284904	1760	8	5	1	2	3	12	37	.32
284904	1768							17	.00
284904	1771							24	.00
806911	0105	26	1	5	21	1	33	33	1.00
806911	0400	3	45	10	1	1	61	217	.28
806911	0490		5	1			5	18	.27
806911	0742							23	.00
806911	0753		1	1			2	21	.09
806911	0791		2				2	18	.11
806911	0913		72				72	86	.83
806911	0921		13	5			15	68	.22
806911	0922	11	103	91	4	3	146	183	.79

SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

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SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
806911	0923	7	6	3	11		18	21	.85
806911	0924	2	6	2		1	7	13	.53
806911	0998	1	2	1	1		3	4	.75
806911	0999	11	82	41	55	4	124	158	.78
806911	1400	5	191	40	1	8	243	1068	.22
806911	1490	2	118	54	21	6	186	615	.30
806911	1601					1	1	1	1.00
806911	1604							1	.00
806911	1616							1	.00
806911	1624		4				4	53	.07
806911	1701	2	5	2	15	5	33	53	.62
806911	1703		12	3	2	2	38	53	.71
806911	1704	6	31	19	3	3	46	218	.21
806911	1707		2				2	16	.12
806911	1713		9	10		3	19	57	.33
806911	1714		9			2	15	52	.28
806911	1721	1	3	3	7	2	7	7	1.00
806911	1723		1	1			2	23	.08
806911	1724		5			15	25	53	.47
806911	1738	4	12	15	3	4	28	99	.28
806911	1741	6	11	3		1	15	54	.27
806911	1742		4	3			6	20	.30
806911	1744		1	5			5	6	.83
806911	1745		5	2		1	8	59	.13

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SUMMARY OF DISADVANTAGED AND HANDICAPPED DATA
RAW DATA SUMMARY

SCH	PROG	ACA	CUL	ECO	MEN	PHY	TOT	ENR	PCT
806911	1750		10				10	35	.28
806911	1769	1	10	1		1	13	62	.20
806911	1771	10	37	43	33	32	84	111	.75

745

APPENDIX N

V. E. 50

746

KANSAS STATE DEPARTMENT OF EDUCATION
DIVISION OF VOCATIONAL EDUCATION
TOPEKA, KANSAS 66612

USD No. _____
(If Applicable)

ENROLLMENT REPORT

(Submit four copies of this report for each individual program offered.)

DIRECTIONS: Submit to: Division of Vocational Education, 120 East Tenth, Topeka, Kansas. Complete only the areas that pertain to your program. Two copies will be returned to you. After closing class, complete columns 97, 98, 99, and 40 and return one copy to the State Office.

Name of school _____ Opening date of school _____ Closing date of school _____
City _____ Name of teacher _____ Social Sec. No. _____ No. of months employed _____
Total Annual Salary _____ Salary Devoted to Vocational Position _____ 2 of time devoted to program _____

SERVICE AND PROGRAM (Check one & name of program) _____ DIVISION (Check one)

Length		Total		Hours	
Length		Total		Hours	
01. ☐ AGRICULTURE					
02. ☐ BUSINESS					
03. ☐ HEALTH					
04. ☐ HOME EC.					
05. ☐ META					
06. ☐ TECHNICAL					
07. ☐ UNDE					

01. ☐ Secondary	05. ☐ Guidance	09. ☐ Existing
02. ☐ Postsecondary	06. ☐ Research	10. ☐ New
03. ☐ Adult	07. ☐ Teacher Training	11. ☐ Expansion
04. ☐ Special	08. ☐ Supervision	

STATE USE ONLY

Signature of Supervisor _____ Date _____

PROGRAM STATUS: (Check where applicable)

☐ Vocational Local Mill Levy - Amount _____
☐ Approved ☐ Approved for Planning ☐ Approved with Conditions

A.M.	DAILY SCHEDULE OF TEACHERS - COORDINATORS		VOCATIONAL-TECHNICAL UNITS	OF CODE
	VOCATIONAL-TECHNICAL UNITS	OF CODE		
01.				
02.				
03.				
04.				

Signature of School Administrator _____

Teacher - Coordinator _____

Date _____

V. E. 50 Front

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APPENDIX O

V. E. 60

749

STATE BOARD FOR VOCATIONAL EDUCATION
TOPEKA, KANSAS

VE-60

PLACEMENT & FOLLOW-UP

Fiscal Year Ending, June 30, 19



1. SERVICE & PROGRAM

2. DIVISION

(check one & fill in name of program)		(check one if applicable)	
01. ☐ Agriculture		01. ☐ Secondary	05. ☐ Guidance Program
02. ☐ Business		02. ☐ Post Secondary	06. ☐ Research
03. ☐ Health		03. ☐ Adult	07. ☐ Teacher Tr.
04. ☐ Home Ec.		04. ☐ Special	08. ☐ Supervision
05. ☐ MDTA			09. ☐ Existing
06. ☐ Technical			10. ☐ New
07. ☐ T. & I.			11. ☐ Expansion
STATE USE ONLY			
Signature of Service Supervisor		Date	

3. VERIFICATION FOR REIMBURSEMENT

TO: State Board for Vocational Education Room 1116, State Office Building Topeka, Kansas 66612 Signature of School Administrator	FROM:	Name of School
		Address
		Location of Program
	District No.	County

INSTRUCTIONS

Submit 3 copies to: State Director of Vocational Education, 11th Floor, State Office Building, Topeka, Kansas 66612, by Oct. 15 of the year that the student completed or terminated his schooling. Complete all information on reverse side as described below.

- Col. A - List name former student (note if name has changed) current address and zip code.
- Col. B - List all social security numbers.
- Col. C - Current age (taken from former records).
- Col. D - Male or Female.
- Col. E - To your knowledge at the present date.
- Col. F - Office of education number of the training gained in your school.
- Col. G - Office of education number of the position held at the present time.
Salary by week, monthly, and yearly.
- Col. H - Date of entry.
- Col. I - Is the graduate of your program working in the area for which you trained him?
- Col. J - K - Check the correct box.
- Col. L - Name of employer, address and zip code.

B-1-CB SM

V. E. 60 Front

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4. PLACEMENT & FOLLOW - UP

NAME & ADDRESS OF EMPLOYEE Vocational - Technical Only)	Social Sec.	Age	Sex	High School Completed	O. E. NUMBERS		ARMED FORCES		School	Employment	NAME & ADDRESS OF EMPLOYER
					Program Objectives	Current Employment & Annual Salary	Date Entered	Using Vocational Training			
01.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
02.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
03.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
04.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
05.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
06.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
07.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
08.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
09.								YES [] NO []	Full Time [] Part Time [] None []	Full Time [] Part Time [] None []	
TOTALS											
A	B	C	D	E	F	G	H	I	J	K	L

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APPENDIX P

VOCATIONAL AND TECHNICAL EDUCATION
PROGRAMS CLASSIFIED WITHIN STUDENT
INTEREST REFERENCES

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VOCATIONAL AND TECHNICAL EDUCATION
PROGRAMS CLASSIFIED WITHIN STUDENT
INTEREST REFERENCES

1. Technicians
 - Data Processing
 - Civil Technology
 - Electronic Technology
 - Commercial Art
 - Photography
 - Drafting
2. Clerical Workers
 - Secretary/Steno
 - Accounting and Computing
 - Office Machine and Key Punch
 - Material Support
 - Communications
 - Typing and Other Clerical
3. Medical Workers
 - Dental Assistants
 - Dental Hygienist
 - Dental Lab Technician
 - LPN Training
 - Medical Assistant
 - Medical Lab Assistant
 - Medical Record Secretary
4. Mechanics and Repairmen
 - Ag Mechanics
 - Air Conditioning
 - Appliance Repair
 - Auto Body
 - Auto Mechanics
 - Aviation Occupations
 - Diesel Mechanics
 - Electronics Vocational
 - Radio and TV Mechanics
 - Small Engines
5. Metal Craftsmen
 - Welding
 - Machine Shop
 - Sheet Metal

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6. Salesworkers
 - Ag Sales and Service
 - Distributive Education Sales and Service
 - Transportation
7. Service Workers
 - Child Care and Guidance
 - Cosmetology
8. Construction Workers
 - Carpentry
 - Electricity
 - Masonry
 - Plumbing
 - Heavy Equipment
9. Agriculture Workers
 - Production Agriculture
 - Horticulture and Ag Resources
10. Drivers and Deliverymen
 - Truck Driving
11. Textile Occupations
 - Clothing Management Production and Services
12. Food Service Workers
 - Food Management Production and Service
13. Protective Service Workers
 - Police Science
14. Transportation and Public Utilities Workers
 - Lineman
15. Printing Craftsmen
 - Graphic Arts

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